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ROYAL BOTANIC GARDENS, KEW

I.—NOTES ON WILD CACAO IN SURINAM AND IN BRITISH GUIANA. J. G. Myers.

In 1920 Professor G. Stahel, Director of the Surinam Agriculture Experiment Station, published a brief description of a stand of wild cacao which he had examined on the Coppename River, of Dutch Guiana (8). His purpose was to discover whether the undeveloped hinterland could be regarded as the source of the widespread outbreak of witches'-broom diseaese (*Marasmius perniciosus*) which was doing such widespread damage in the cacao plantations of the lowlands. He wished also to examine the wild cacao for potential insect pests which had not yet reached the cultivated areas.

The present writer, investigating for the Empire Marketing Board the possibilities of biologically controlling the more important insect pests of the West Indies, wished to search the wild cacao for possibly utilisable parasites of the major insect pests of the cultivated plant—notably cacao thrips (*Heliothrips rubrocinctus*) and cacao beetle (*Stirastoma depressum*). The results of this examination will be published when the insects concerned have been determined. It is sufficient to state here that the chief insect pests of cacao were not found attacking the wild tree ; and this, taken in conjunction with Reyne's observations, seems to indicate that thrips and cacao beetle, at any rate, have become attracted to cacao from other wild host-plants (for the beetle, notably *Pachira* spp.) since its extensive cultivation.

As the locality has not been visited since Prof. Stahel was there in 1920, and in view of Pittier's recent work (4 and 5), a few notes on the cacao trees themselves and their environment may be of botanical interest.

Paramaribo was left on 24th May, 1929, first by road, a few miles, and then by launch down a canal in a westerly direction to the Saramacca River, down which we journeyed all night to the sea, and passed up the mouth of the Coppename River before dawn the next day.

The banks were densely mangrove-clad (*Rhizophora Mangle*) with occasional stretches of *Drepanocarpus lunatus* on the waterfront. Even only a few miles above the mouth, tall *Montrichardia aculeata* was not infrequent among the mangroves.

At noon we passed the mouth of the Tibiti Kreek, and thenceforward the mangroves lost their dominance, and were largely

replaced by *Drepanocarpus* backed by high and luxuriant *Montrichardia*. Behind this again the low mixed forest showed vast numbers of slender *Euterpe edulis* palms, often in pure stands of considerable extent. A *Maximiliana* was also fairly plentiful.

Very early in the afternoon the water front began to be occupied extensively by *Pachira aquatica*, interspersed with stretches of *Montrichardia*, sometimes bordered by beds of a *Crinum*.

Later a species of *Inga* appeared as a fringing bush, while the stretches of *Pachira* were varied with trees of *Pterocarpus draco*. *Euterpe edulis* continued the dominant palm at least on the banks. We continued after dark as far as Heidotti, the highest Indian (Carib) settlement on the Coppename, and spent the night there.

Continuing up the river next morning (26th) we found the vegetation of the banks profoundly changed. For some distance past the village there was considerable secondary growth—*Cecropia peltata*, *Triplaris surinamensis*. *Spondias* sp., a whitish berried *Cordia*, and bamboo.

The virgin forest later was of a mixed type, with a heavy fringe of creepers forming a curtain at the water's edge. Certain of these vines, notably *Allamanda cathartica* and undetermined members of the families *Malpighiaceae*, *Bignoniaceae*, *Convolvulaceae* and *Papilionaceae*, were in full flower. The dominant palm was now maripa (*Maximiliana Maripa*). *Montrichardia* was still frequent in places, but *Pachira aquatica* had gone. Small groves and clumps of *Ravenala guyanensis* appeared, and an *Ischnosiphon* was plentiful. Among the small trees was *Pentaclethra filamentosa*. Later, two species of *Costus* formed extensive brakes.

The scattered taller forest trees further from the bank now sometimes bore long streamers of *Tillandsia usneoides*.

The bank fringe in places consisted entirely of shrubs and small trees of a species of *Inga*. *Genipa americana* also stretched its branches over the water.

There were here and there considerable stands of *Heliconia Bihai*.

Kaaimanston, the highest Boschneger village on the Coppename River, was reached the same morning and arrangements made for the hire of dug-out canoes and paddlers for the journey up the Kwamma Kreek.

The mouth of this tributary (known also as the Marame) was entered about noon the next day, the launch being left in the main river, and the rest of the journey made in three canoes. The vegetation of the banks from Kaaimanston to the Kwamma Kreek showed little change from that of the previous day. *Inga* sp. was even more common.

On the creek, the forest was of the same mixed type, with occasional tall trees, among which were recognised silk-cottons (*Ceiba pentandra*) and some unusually large *Pentaclethra filamentosa*.

Patches of water-guava (*Psidium polycarpon*) appeared in the water near the bank or even (on submerged rocks?) in mid-stream. The water was very high.

Camp was made early in the afternoon and shelters thatched hurriedly with palm-leaves kept out the torrential rains, which fell without ceasing during the evening and night. The dominant palm of the undergrowth, and the one which was used for the camp-shelters was an undetermined species of *Astrocaryum*, known locally as " boegroemakkas " as Prof. Stahel informed me on our return. It was plentifully covered with long, brittle black spines.

Soon after leaving camp next day, rapids were encountered, and again at frequent intervals till we reached our final camping place, soon after noon, near the wild cacao on the Mamaboen Kreek, up which, from the Kwamma, we had to cut a way for the canoes through the bushes and trees which met over the water.

It was in this Mamaboen Valley that Stahel found cacao trees for a distance of some 6 or 7 kilometres, and he was informed by a reliable Boschneger (Granman Mentor) that the trees extend along the whole valley, which is 30 to 40 kilometres long.

Wet season conditions, with the frequent occurrence of flooded areas, made progress through the bush rather difficult, and we were able to explore only a very small part of this area in the three and a half days available.

By the character of the undergrowth the country traversed could be divided into three main types ; firstly, the slightly higher patches with an undergrowth consisting almost solely of the boegroemakkas palm (*Astrocaryum* sp.) ; secondly, the lower areas, with stands of *Ravenala guyanensis*, *Euterpe edulis*, extensive beds of a *Heliconia* with canary-yellow bracts which I saw also on the Upper Barima River in British Guiana, some *Heliconia humilis* and an occasional *Socratea exorrhiza* ; and thirdly, the intermediate lands, which comprised most of that we examined, and had a floor-covering of low ferns, *Ischnosiphon* sp., bush-rope tangles and an undergrowth of diverse shrubs, with *Maximiliana Maripa* the most abundant palm.

Between these types there was considerable overlapping. The *Astrocaryum* often entered largely into the shrub undergrowth and took the place of the *Maximiliana* : the *Ravenala* sometimes occurred in the same intermediate association. On the higher ground were occasional truly gigantic silk-cotton trees, and on the rocks themselves or on the adjacent forest floor was a slender *Heliconia* with a darkly spotted stem and bracts of a clear cherry-red colour, which is found also on the Upper Barima River. On the floor of the shrub association the curious red Balanophoraceous plant, *Helosis guyanensis* (determined by Prof. Stahel from my description), was not uncommon.

These three associations were largely distinguished by the plants of the floor and undergrowth, the trees, even of the lower tiers, save the palms, being largely neglected for lack of determinations. All three associations were, however, under the dense shade of tall forest, though the large trees of the uppermost storey were scattered.

Among the larger trees, a cedar (*Cedrela* sp.) occurred at very rare intervals. It is cut and floated down the rivers by the Boschnegers, for disposal to traders lower down and for use as bride-price and in other tribal customs.

Right on the bank of the Mamaboen, above our camp, was a tall tree of a species of *Pachira*, interesting as occurring nearly three days' journey above the last *Pachira aquatica* on the main river. Its pods were high out of reach, but appeared smaller, shorter and more oblong than those of *P. aquatica*.

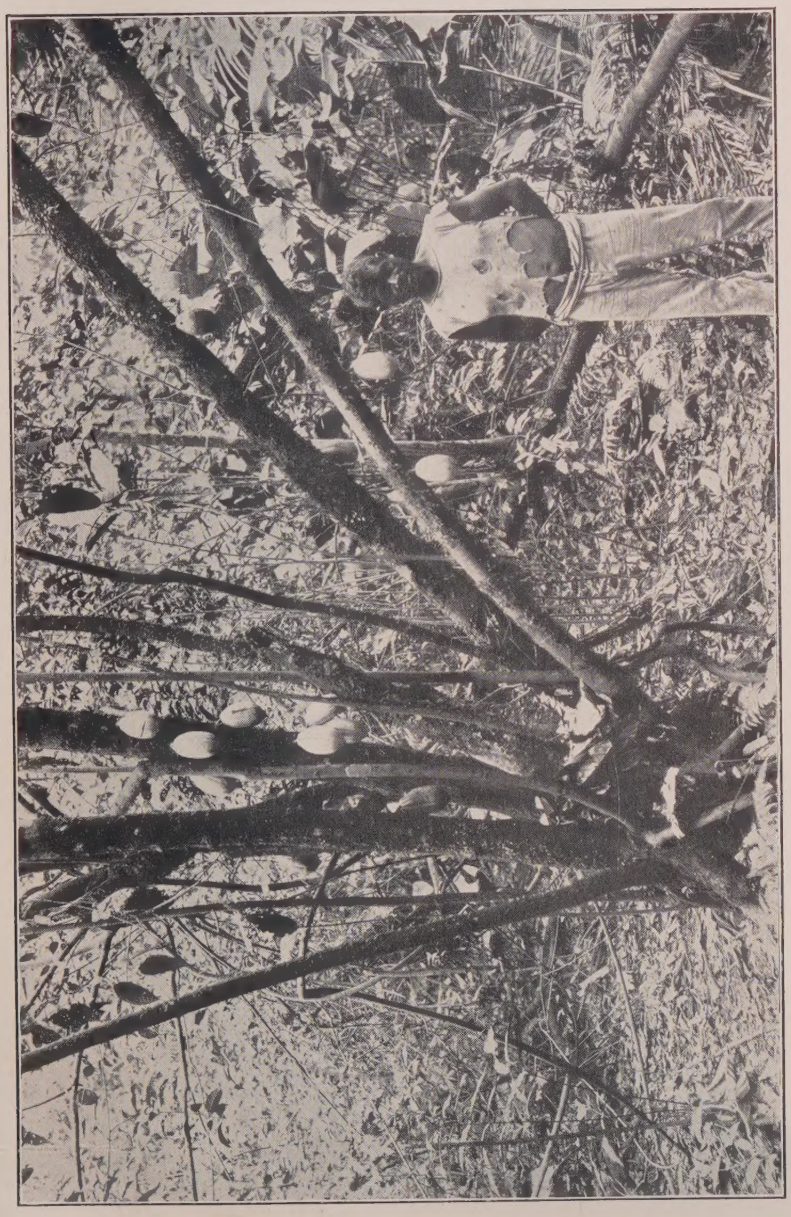
The cacao trees were found usually in the intermediate association described above, with shrubby undergrowth and ferns. A number grew in lower ground, however, with their branches stretching far out over the creek or a tributary and their bases sometimes even deeply submerged in flood water. The smallest number, only one or two, was found in the higher ground, in the boegroemakkas association.

The cacao trees were constituents of the lowest storey of small trees, and were thus shaded not only by the scattered large trees of the highest layers, but also by those of the intermediate tiers. Some trees were growing singly, but most were in small groups of two to five. They varied in height from about 10 to 25 feet. There appeared to be no regeneration from seed, though in one case several germinating seeds were found lodged in the fork of an old parent tree. Most young trees originated from old nearly prostrate trees, which sent up shoots perpendicularly at intervals along their trunks, and adventitious roots downwards, sometimes from a height of several feet, like a mangrove. As the result of the dense shade and of their origin from old trees after this fashion, the trees were all asymmetrical, straggly and even spindling; though occasional trees stretching over the water were quite luxuriant. The foliage was everywhere green and healthy, save for occasional attack by biting insects, including a large and hitherto unrecorded Sphingid larva.

No flowers whatever were found. Fruit was plentiful, though less so than on most cultivated trees; but was nearly all unripe, and of a pale glaucous green colour. The ripe pods were of a bright clear yellow colour, with little indication of longitudinal ribs, and contained between 40 and 50 seeds of a deep lilac colour internally. The most interesting feature of the pods was their extreme uniformity. All were of the Amelonado Forastero type, with no variation. Prof. Stahel informs me that he now knows four other localities where wild cacao occurs in the interior of Surinam. He has examined two of these and has seen pods from a third, and found them to be all of this same type, which does not correspond with any of those cultivated in Surinam.

The ripe pods were quickly eaten, apparently by monkeys, judging by the form of the teeth-marks, and on the testimony of both Indians and Boschnegers. Even green pods were found

PLATE II



A wild cacao tree with several trunks, on the "plateau" in the Mamaboen Creek Valley.

[*To face page* 4.

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tentatively bitten into, while ripe pods, emptied of their contents, were often found long distances from the nearest cacao tree.

Witches'-broom disease (*Marasmius perniciosus*) was frequent on the Mamaboen trees, as recorded by Stahel in 1920 (8). In fact this authority considers the present locality to have been the source of the widespread outbreak in the Surinam plantations, its great distance (170–180 kilometres) from the nearest of these explaining why cacao was grown without attack for 200 years.

The grounds for considering the above cacao bush as virgin forest and not the remains of forgotten Dutch or aboriginal plantations are as follows :—

The Coppename River is believed to be entirely uninhabited above Kaaimanston, which is 42 kilometres below the cacao. The highest Indian village is many miles (half a day) lower still, while all the Boschneger settlements on the Coppename, of which Kaaimanston is the highest, were founded subsequently to 1880, when these people were sent there from Saramacca (Stahel, 1920). Even to the present day no cacao is cultivated on the Coppename. The present Indian tribes of the Guianas do not know the use of cocoa and apparently never cultivate it (Schomburgk, John Ogilvie). Yet other extensive stands exist much farther in the interior, even near the Brazilian border.

Mr. John Ogilvie, whose knowledge of the interior of British Guiana is almost unrivalled, has kindly given me some notes on the occurrence of true wild cacao in that colony.

It is apparently confined to the far interior, where, however, it " grows extensively." Mr. Ogilvie writes, " The farthest north that I have seen cocoa is in Black creek, a branch of the Essequebo on the right bank, some distance *above* the mouth of the Rupununi River. It is plentiful in this creek, so much so that a balata bleeder in 1911 thought he had stumbled across an abandoned Dutch plantation and tried to get up a company in Georgetown for its exploitation. This creek is a short way to the South of the line from Primos Inlet, cut by the late H. P. C. Melville from the Rupununi River to the Correntyne. I have also seen cocoa on the Berbice River at a point due east of Black creek ; the Berbice at this point being only a tiny creek."

The cacao near Primos Inlet was earlier seen by Robert Schomburgk (7, p. 134) who recognised it as *Theobroma Cacao* and remarked on its flourishing condition. He wrote, " es unterliegt wohl keinem Zweifel, dass die Bäume ursprünglick von den Indianern gepflanzt worden waren ; aber aus ihrer bedeutenden Anzahl und ihrer weiten Entfernung vom Ufer musste ich schliessen, dass die Früchte durch Thiere vertragen, und die Bäume so verbreitet worden waren." We shall see later that there are practically no grounds for this view that the tree was originally planted.

Ogilvie has seen wild cacao also " on the upper branches of the Rewa and Quitaro creeks. The Rewa is a branch of the Rupununi

River. Cocoa occurs plentifully at points on the Kuduwini (Cuyuwini), Kassikedju or Dewar Wow, on the Kamu and Shewdikar creeks—all branches of the Upper Essequebo, as also on the main river itself."

It occurs again " on the Mapur Wow, the Trombetas and the Ha River. This is in Brazil, south of the Tumac Humac Mts., and I saw it in the Quitari (Kwitari) River, the boundary creek between Surinam and this colony, which creek eventually forms the Correntyne."

Robert Schomburgk (7, p. 58) saw the "*Theobroma Cacao* growing spontaneously" on the Capiwhuin (Kafuwini, a branch of the Trombetas, which is in its turn a tributary of the Amazon), where Ogilvie has also met with it. Schomburgk (p. 88) records it also on the Cutari (at the head of the Correntyne) and (p. 33) on the Upper Guidari (Quitaro). Of the last locality (visited also by Ogilvie) Schomburgk writes:

" We had to cross numerous swamps abounding in a species of Cacao, *Theobroma bicolor* (?). The large melon-shaped fruits of all sizes, some green, some of a bright yellow, were eagerly collected by our Indians; and indeed the pulpy arillus which surrounds the bean has an agreeable vinous taste. There was sufficient evidence that rats, agouris, monkeys and peccaries were as eager after the fruit as our Indians, who, however, did not appear acquainted with the fine aroma which the seed itself possesses, and which induced Linnaeus to call it the food of the gods. We collected a number of seeds, of which I counted as many as sixty in one capsule. They afforded us for some mornings the most delicious cup of cocoa I ever tasted."

" It is remarkable that cacao in its wild state is only found in swampy, or, at best, moist situations. The trees which I observed, although of a peculiar growth, almost shrubby, and the trunk less developed than in large forest trees, often attained the height of 50 feet. The capsules were large, and contained from 60 to 70 seeds, which were larger than in the cultivated kind, but not so thick."

It will be seen that there is some uncertainty as to the species recorded by Schomburgk as wild cacao. In some localities he calls it *Theobroma Cacao* and in others identifies it, with a query, as *T. bicolor*. His brother, Richard Schomburgk (1848, 3.Th., pp. 844, 922). gives the name *T. Cacao* only to the cultivated plant. *T. bicolor* is, of course, a very different looking tree, with large, oval fruits, strongly reticulately-ribbed. Yet Richard Schomburgk saw what was almost certainly true wild cacao himself, on the Upper Pomeroon River in British Guiana (*Travels*, vol. ii., p. 394). He writes, " In the thicket along the banks I was astonished to find a number of cacao trees, laden with their beautiful yellow fruits. As settlements had never advanced as far up as we now were, the seeds must have got here at all events through some other agency, for I hardly believe that they are to be found wild on the coast and in this latitude. A special reason for this assumption is further, that

the coastal tribes have no particular name for the tree, but also call it cacao." The description given by the Schomburgks and by Ogilvie, of the wild cacao in the interior of British Guiana, corresponds fairly closely with that of the Surinam form on the Mamaboen ; though some of Schomburgk's trees are certainly taller than any I saw. Schomburgk especially mentions the bright yellow colour of the ripe pods, while Ogilvie writes that " most pods are a greeny brown colour, but others are a light yellow. I cannot say whether they are different varieties or not. The dark colour predominates largely, and it may be that the yellow ones are ripe, although I think I have seen the purple of the seed showing in both varieties." It is then, in the absence of specimens of the British Guiana form, uncertain whether this is identical with the Surinam plant. But whether it is or not, Ogilvie is convinced it is truly indigenous. The Indians consider it poisonous, and *never* eat it, even when starving. " There are no signs of old settlements in these rivers, nor do the aboriginal Indians have any myths or traditions of former settlers. Cocoa must therefore be indigenous. In any case those seen must have been self-planted and they must have been doing so for generations." (J. Ogilvie, 14th June, 1929.)

Cacao of possibly the same type, and identified as *Theobroma Cacao,* is, according to Ducke (1925) " Indubitablement spontané dans le cours supérieur du petit Rio Branco au Nord-Est de Obidos, et à l'interieur de la localité Francez au moyen Tapajos ; dans les deux regions, exclusivement dans les sousbois d'un forêt très riche en Palmiers [' Uauassu ' *Orbignya speciosa* (Mart.) Barb. Rodr], en terrain humide ou un peu marécageux. Les fruits de ces cacaoyers sauvages ont la forme et la couleur (jaune) des arbres cultivés et sub-spontanés partout en Amazonie." It would be interesting to ascertain whether it occurs between these Brazilian localities and those mentioned by Ogilvie near the British Guiana border.

The apparent purity of type of the Surinam wild cacao is strong evidence of spontaneity, for Pittier has shown how mixed are the stocks of cultivated cocoa. This mixture is well shown even in some of the oldest of what Professor Dash has appropriately termed " historical cacao " (2). In British Guiana, at Coomacka, on the Berbice River, are the remains of a cacao plantation established some 200 years ago by a Dutch planter whose tombstone is still to be seen. Sir John Harrison visited this in 1913 and found that some of the cacao now formed large forest trees, up to 70 feet high (thus in marked contrast to the Surinam wild cacao). The type was identified as " Golden Caracas " and Harrison claimed that it was uniform and pure. Dash, however, while confirming Harrison's other observations, found undoubted evidence of mixture. He writes (2) " so far as one can judge, the plot contains a mixture of *Criollo* and *Forastero* types, while the descriptions (by the Government Botanist) also indicate that the trees are not of one type as previously supposed, but appear to be of mixed origin, showing characters associated with *Criollo* and *Forastero.*"

For arranging the expedition up the Coppename River and for releasing Mr. J. W. Van Dijk, Government Chemist, to lead it, the writer is deeply indebted to the Surinam Government and especially to Prof. Stahel, Director of the Agricultural Experiment Station.

The success of the expedition was due entirely to the good management of Mr. Van Dijk. For help and hospitality to himself and his wife the writer takes pleasure in thanking also Prof. and Mrs. Stahel, Mr. and Mrs. J. A. Van Beek and Commissaris and Mrs. Munder. Prof. Stahel has kindly sent two of the very few ripe pods obtained to Professor Cheesman at the Imperial College of Tropical Agriculture, and the seeds have been sown for genetic study.

In connection with Dr. Myers' account of the wild Cacao in the Mamaboen Creek it is of interest to be able to record that two well-developed and perfectly formed ripe pods collected from the wild cacao trees in the Mamaboen Creek valley were very kindly sent to Kew in July last by Prof. Stahel. These fruits, which were preserved in fluid, are of the typical Amelonado-Forastero type. A number of young living plants, grown from seed from the same source, have also been received at Kew. These were sent over in a Wardian case from the Paramaribo Experiment Station and are making satisfactory growth. The uniformity that exists in this stand of wild cacao in Surinam—a feature on which stress is laid by Prof. Stahel and by Dr. Myers—is a matter of great interest and suggests the possibility of a homozygous strain of cacao being isolated from this source.

The probable connection pointed out by Prof. Stahel, that this stand of wild cacao may have with the now widespread witches'-broom disease (*Marasmius perniciosus* Stah.), in Surinam and Demerara is interesting. The disease was first noticed in about 1900 in plantations along the lower Saramacca river in Surinam. From there it spread to other cacao plantations in Surinam and eventually to adjoining parts of British Guiana. The Mamaboen Creek wild cacao, when discovered by Stahel in 1920, was reported by him to be badly infected with witches'-broom disease, and the same state of affairs was noticed by Dr. Myers on his visit—nearly ten years later. It seems safe to assume that the disease must have been continuously present in that area. Until the discovery of this wild cacao the disease had not been recorded on a truly wild host. The disease does not occur on plants other than species of *Theobroma*. In addition to plantation cacao the only two species of *Theobroma* on which the disease has been observed are *T. speciosa* Spr. and *T. bicolor* Humb. & Bonpl. These species seem to be susceptible only in the young stages, and ten to eleven year old trees at the Paramaribo Experiment Station, though growing next to heavily infected plantation cacao, very rarely showed any sign of the disease. At first it was thought, by van Hall and others, that *Theobroma speciosa*, which occurs wild in Surinam, must be the original

host of the disease, but this opinion was abandoned when the disease could never be found on trees of this species in the wild state. Moreover, cultivated cacao, free from the disease, was known to exist in the colony growing close to trees of *Theobroma speciosa* in the neighbouring forest.

Another more recently recorded species in Surinam is *Theobroma Herraniae* (Stahel, 8), the occurrence of which has in recent years been recorded from various localities, particularly along the Correntyne, Coppename and Morowijne rivers. Careful search has been made but witches'-broom disease has not been found on this species. The entire absence of the disease in these species of *Theobroma* led Prof. Stahel to the belief that some species as yet unknown, but closely related to plantation cacao, must exist somewhere in the hinterland, harbouring the disease. This culminated in his discovery of the wild cacao in the Mamaboen Creek valley.

As is the case with many other cultivated plants of long standing, the area which should be regarded as the original home of our cultivated cacao cannot be stated with certainty. It is generally assumed that it originated in the Orinoco valley and Upper Amazon where it occurs in much the same manner as in the Mamaboen Creek valley. Similar wild cacao occurs in the Upper Oyapok in French Guiana and has been known for upwards of a hundred years. Prof. Stahel makes the suggestion that the whole of the highland area, which extends from French Guiana in a westerly direction to the North of the Amazon valley might be regarded as the original home of Forastero cacao.

For Criollo the source of origin is probably farther to the west, either towards western Venezuela and Colombia or farther north among the Central American countries. Typical Criollo, in what was believed to be a truly wild state, has recently been recorded in British Honduras by Mr. H. C. Sampson (Economic Botanist, Kew), and members of the Forestry Department in British Honduras. Its distribution is stated to be confined mainly to the south of the Colony, where it occurs "in high bush and Cohune forest types in Silkgrass Reserve: of rather infrequent and scattered occurrence in the valley levels and foot-hills, the trees being generally lank with straggling open crowns." Pods of this cacao, kindly forwarded to Kew by the Conservator of Forests, show that there is no doubt that it is typical Criollo. There is, however, a certain element of doubt as to whether this cacao is truly wild and indigenous, or whether it may not owe its origin to early cultivation of Criollo in British Honduras. It would be of interest to know whether this form occurs under similar conditions in the territory between British Honduras and Venezuela.

The photographs reproduced on Plates I and II were taken by Prof. Stahel and were published in De Indische Mercuur of the 24th September, 1920. Dr. de Bussy, Director of the Commercial Museum of the Colonial Institute, Amsterdam, with whom Professor

Stahel's negatives are deposited, has very kindly permitted their reproduction in the Bulletin.

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II.—NUXIA AND LACHNOPYLIS IN AFRICA. C. A. Smith.

The genus *Nuxia* Lam. (Loganiaceae) is commonly credited with some 45 species, one, *N. verticillata* Lam., from Mauritius and Réunion, about a dozen from Madagascar and the Comoro Isles, and the remainder from Tropical and South Africa. Hitherto, however, no attempt seems to have been made to subdivide the genus, which is somewhat remarkable in view of the fact that it is composed of two sharply defined groups, differing from each other in their inflorescence as well as in floral details. The explanation of this may possibly be that the generic diagnosis of *Nuxia*, as formulated by later authors, was drawn up largely, if not entirely, from the characters of African and Malagasy species to the neglect of those of

the nomenclatural type. In the writer's opinion, however, the differential characters are of such a nature as to warrant the recognition of two independent genera, *Nuxia* Lam. (monotypic), and *Lachnopylis* Hochst., which accommodates all the African and Malagasy species referred to *Nuxia* by Robert Brown and later authorities.

The genus *Nuxia* was based by Lamarck (Ill. Gen. i. 295 : 1791), on *N. verticillata* Lam., an arborescent shrub discovered in the Ile de France (now Mauritius) by Commerson* during his voyage round the world with Bougainville, and was probably named, as suggested by Cordemoy (Fl. Réun. 467 : 1895), in honour of "M. de la Nux, amateur de sciences à la Réunion, correspondant de Buffon."

About a quarter of a century later, Robert Brown (in Salt, Abyss. App. 63 : 1814) published the names *Nuxia congesta* and *N. dentata* as nomina nuda for two species collected by Salt in Abyssinia, these being subsequently described by Fresenius (Flora, xxi. 2, 606 : 1838) and Bentham (DC. Prodr. x. 435 : 1846) respectively.

Curiously enough, in 1843 the same two species were independently described by Hochstetter in Flora, xxvi. 77, from specimens collected by Schimper in Abyssinia during the previous year, as syntype-species of a new genus *Lachnopylis*, the species being named *L. ternifolia* and *L. oppositifolia*. In the generic diagnosis Hochstetter described the inflorescence as cymose, the corolla-tube as equalling the calyx, and the style as being long-exserted, characters which immediately distinguish *Lachnopylis* from *Nuxia* Lam. sensu stricto. Two years later, the generic description of *Lachnopylis* was greatly amplified by Alph. De Candolle (Prodr. ix. 22), who observed that the cymes were "2–3-chotomous" (i.e. dichasial and trichasial). Yet in the following year *Lachnopylis* was reduced to *Nuxia* Lam. by Bentham (DC. Prodr. x. 434), who cited *L. ternifolia* and *L. oppositifolia* respectively as synonyms of Brown's two species. Bentham either did not observe, or (more probably) regarded as of little moment, the differences in inflorescence, relative length of corolla-tube to calyx, and that of style to corolla tube, which separate *Lachnopylis* from *Nuxia*. Since this reduction of *Lachnopylis*, no one seems to have questioned the unity of *Nuxia*, or even to have proposed its subdivision. But when naming South African specimens of *Nuxia*, recently sent to Kew by the Division of Plant Industry, Pretoria, the writer was led to investigate the affinities of two apparently undescribed Transvaal species with the Tropical African *N. polyantha* Gilg, and with the Malagasy group of species. The striking difference existing between the inflorescence of *N. verticillata* Lam. and that of all other species currently referred to *Nuxia* suggested that further differences might be found on investigation. The results obtained make an excellent case for retaining the genus *Lachnopylis* for the African and Malagasy species, thereby reducing

* Commerson had actually proposed the name *Nuxia* for the genus (vide Juss. Gen. 107, sub *Manabea* Aubl.), though Lamarck makes no mention of this.

Nuxia to which these are currently referred, to a monotypic genus unrepresented in Africa.

The two genera may readily be distinguished as follows :—

Nuxia : (Fig. 1, B).

1. Inflorescence repeatedly racemosely branched, with even the ultimate cymules arranged racemosely.
2. Corolla manifestly exserted from the calyx, with filaments about as long as, sometimes even shorter than the corolla-lobes, the latter not overlapping the calyx.
3. Style shorter than the corolla-tube.

Lachnopylis : (Fig. 1, A).

1. Inflorescence repeatedly dichasially branched with the ultimate cymules arranged cymosely.
2. Corolla tube as long as the calyx, with the lobes shorter than the long prominent filaments, and reflexed over the upper part of the calyx.
3. Style always much exserted from the corolla-tube.

Nuxia [*Commers. ex Juss.* Gen. 107 (1789), sub *Manabea* Aubl., pro syn.] *Lam.* Ill. Gen. i. 295 (1791) ; Pers. Syn. i. 132 (1805), excl. *N. elata* (Swartz) Pers. ; Jaume St. Hil. Expos. ii. 344 (1805) ; Juss. in Ann. Mus. Hist. Nat. Par. vii. 66 (1806) ; Roem. & Schult. Syst. Veg. iii. 5 (1818) ; Spreng. Gen. i. 82 (1830) ; Endl. Gen. 687, n.3972 (1839), partim ; Benth. in DC. Prodr. x. 434 (1846), pro minima parte ; Benth. & Hook. f. Gen. Pl. ii. 792 (1876), pro minima parte ; Baker, Fl. Maur. & Seych. 234 (1877), pro minima parte ; Baill. Hist. Pl. ix. 347 (1886), excl. ref. Afr. spp. ; Engl. & Prantl, Nat. Pflanzenfam. iv. 2, 45 (1892), pro minima parte.

A glabrous and eglandular arborescent shrub, with moderately stout branches ; the latter somewhat angled in the young stages, at length terete and covered with a greyish firm persistent bark, conspicuously pitted below the growing twigs with the old leaf-scars. *Leaves* long-petioled, 3–4-nately whorled along the young branches, casually opposite along the youngest shoots, coriaceous ; stipules 0 ; interpetiolar ridge obsolete. *Inflorescence* terminal, repeatedly and laxly racemosely branched, only the ultimate branching being cymose, with the lowest branches arising from the axils of the uppermost leaves. *Flowers* small, and collected in cymules. *Calyx* 4-lobed, with ovate teeth which are from $\frac{1}{2}$–$\frac{1}{3}$ as long as the tube ; the latter short, cup-shaped, thin in texture, glabrous within. *Corolla* 4-lobed ; tube subcampanulate, exserted from the calyx, circumscissile above the persistent base, with the throat covered by a more or less dense growth of bristly hairs ; lobes strongly reflexed over the exserted part of the corolla-tube, neither cucullate at the apex nor provided with a callosity. *Stamens* 4 ; filaments wholly exserted, inserted on the corolla-throat between the lobes, as long as (sometimes shorter than) these, glabrous ; anthers 2-thecous, with the thecae

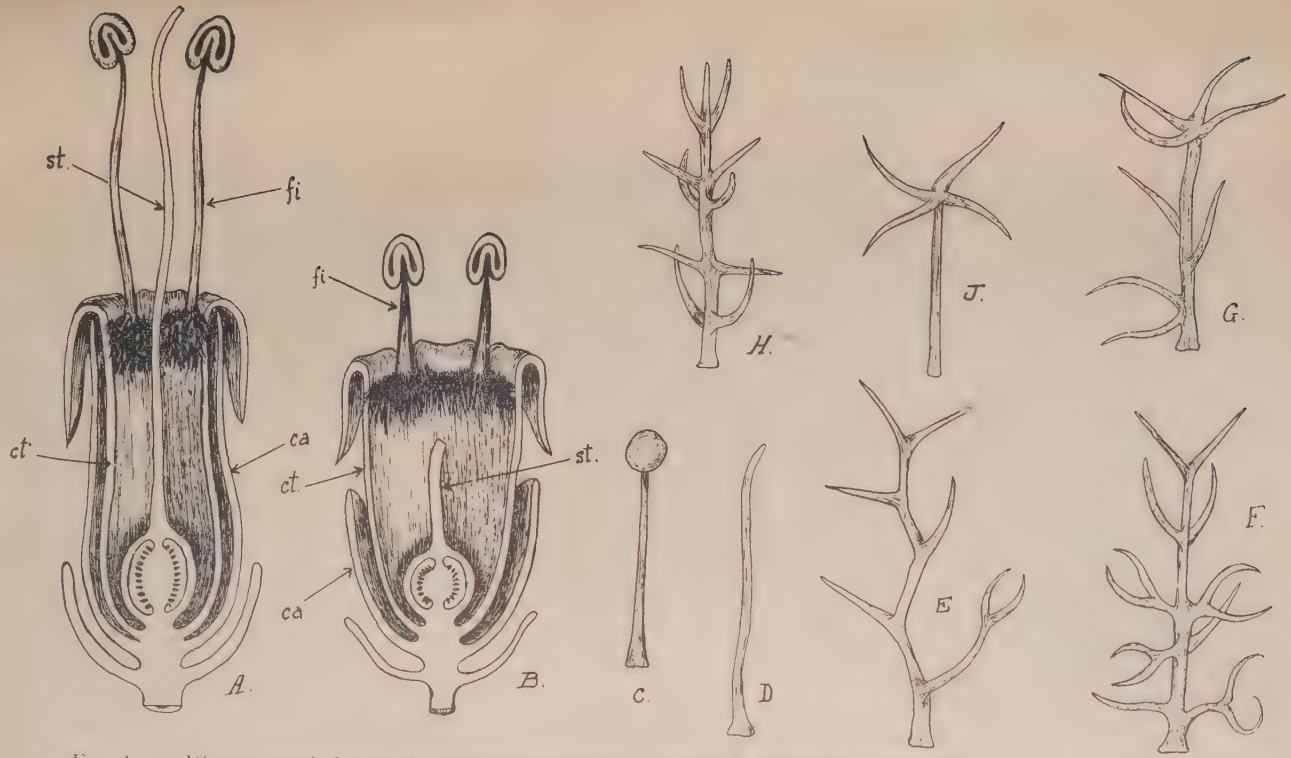

FIG. 1. A, Diagrammatic longitudinal section through a flower of *Lachnopylis montana* C. A. Sm., and B through a flower of *Nuxia verticillata* Lam. showing relative lengths of calyx (ca) to corolla tube (ct), and style (st) to corolla tube and filaments (fi). C—J, Various types of hairs composing the indumentum in *Lachnopylis*:— C, Stipitate gland; D, Simple hair, from the leaves of *L. pubescens* (Sond.); E—H, Dendritic hairs from the lower surface of the leaves of *L. schistotricha* C. A. Sm.; J, Stalked stellate hairs from the lower surface of a leaf of *L. montana* C. A. Sm. All much enlarged.

confluent at the apices, at first cordate-reniform, at length strongly divergent. *Ovary* ovoid, silky-white hairy, 2-locular, with axile placentation and with numerous ovules in each loculus; style terminal, much shorter than the corolla-tube, glabrous; stigma terminal, truncate. *Fruit* a 2-valved capsule, only slightly exserted from the persistent calyx. *Seeds* oblong, small, numerous.

Monotypic. Endemic in Mauritius and Réunion.

N. verticillata *Lam.* Ill. Gen. i. 295, t. 71 (1791); Pers. Syn. i. 132 (1805); Jaume St. Hil. Expos. ii. 344 (1805); Roem. & Schult. Syst. Veg. iii. 103 (1818); Breon, Cat. Pl. Cult. Bourb. 28 (1825); Benth. in DC. Prodr. x. 434 (1846); Baker, Fl. Maur. & Seych. 235 (1877); Cordemoy, Fl. Réun. 466 (1897).

Leaves elliptic to broadly oblong-elliptic, up to 11 cm. long and 7 cm. wide, obtusely rounded at the apex or acute, cuneate to the base into the 5 mm. to 3 cm. long petiole, with subrevolute entire margins. *Inflorescence* up to 20 cm. long and 28 cm. in diam., more or less pyramidal, with angled branches; secondary and further branches opposite to subopposite, more frequently alternate. *Calyx* about 2 mm. long. *Corolla* about twice as long as the calyx, and exserted for about half its length. *Filaments* somewhat widened to the base. *Style* about half the length of the corolla-tube. Other characters as for the genus.

Mauritius (Ile de France), sine loc. exact., *Commerson* ! (type, BM, K*); *Bojer* ! (K); *Michaux* ! (K); etc.

In Mauritius the species is a common constituent of woods, e.g. those of the Pouce, Nouvelle Decouverte, etc., ascending to the tops of the mountains, and in Réunion (Bourbon) Cordemoy states (loc. cit.) that it is " très commun dans les forêts des zones basse et moyenne, et jusqu'à 2000 m. d'altitude. Fleurit en avril-mai. Fleurs d'un rose pâle, quelquefois blanches."

Common names: *Bois Malabar* or *Bois de Bouc* (Maur.), and *Bois maigre, Malbrouc,* or *Valaker* (Réun.).

In Réunion the timber is said to be used for building purposes, affording a more or less inferior grade of rafters employed in roofing houses.

In his original description of the genus, Lamarck describes the capsule as being dispermous, whereas the loculi are many-seeded, as has already also been pointed out by Jussieu (in Ann. Mus. Hist. Par. vii. 66 : 1806), who remarks " Michaux examina cette plante à l'Ile-de-France, et reconnut que le fruits étoient des capsules à deux

*In citing specimens under the descriptions and references which appear in this article, the following abbreviations have been inserted after the numbers to indicate the herbaria in (or from) which the particular specimen was examined :—

BM, British Museum (Natural History), South Kensington. K, Royal Botanic Gardens, Kew. Pa, National Herbarium, Division of Plant Industry, Pretoria, South Africa. R, Herbarium of Rev. F. A. Rogers. Be, Botanical Museum and Gardens, Berlin—Dahlem. Z, Botanical Museum of the University of Zürich.

loges, remplies de graines nombreuses et menues, et il nous en envoya pour nous donner de moyen de vérifier nous-mêmes ce caractère."

Lachnopylis *Hochst.* in Flora, xxvi. 77 (1843); Endl. Gen. Suppl. 3. 74, n.3371/1 (1843); A.DC in DC. Prodr. ix. 22 (1845).

Nuxia Harv. Gen. S. Afr. Pl. 256 (1838); Endl. Gen. 687, n.3972 (1839), partim; Bureau, Fam. Logan. 77 (1856); Harv. Gen. Ed.2, 249 (1868), pro majore parte; Benth. & Hook. f. Gen. Pl. ii. 792 (1876), pro majore parte; Engl. & Prantl, Nat. Pflanzenfam. iv. 2, 45 (1892), pro majore parte; Baker in Dyer, Fl. Trop. Afr. iv. i, 511 (1903); Sim, For. Fl. Cape Col. 274 (1907); Thonner, Blütenpfl. Afr. 455 (1908); Sim, For. Fl. Port. E. Afr. 90 (1909); Prain & Cummins in Dyer, Fl. Cap. iv. i, 1038 (1909); Phillips, Gen. S. Afr. Pl. 476 (1926); non Lam.

Dwarf or arborescent shrubs or tall trees, variously pubescent or tomentose on the young parts, inflorescence and leaves with stalked stellate or dendritic or candelabra hairs, or with stipitate glands mixed with simple non-glandular hairs, rarely glabrous in all parts. *Branches* moderately stout, ascending or spreading-ascending, with greyish to reddish-brown fibrous stringy bark. *Leaves* most frequently in 3- (rarely 4-) nate whorls and casually opposite only along the very young shoots, more rarely opposite and decussate, subsessile to shortly or long-petioled, very generally glandular-punctate, prominently 1-nerved, with from 4 to 13 pairs of upcurving prominently raised lateral nerves blending with one another along the margins, occasionally with the lateral nerves depressed and reddish in colour; stipules 0; interpetiolar ridge obsolete. *Inflorescence* terminal, rarely also axillary, densely many-flowered, repeatedly dichasial after the primary racemose branching, or, in one species, after 2- to 3-racemose branchings, or the flowers collected in dense globose or didymous pseudocapitula at the ends of the primary (rarely also the secondary) branches; the lowest branches arising singly (occasionally in pairs) in the axils of the uppermost bract-like leaves. *Flowers* often sweetly scented, sessile to long-pedicelled, generally disposed in more or less compactly arranged terminal 3-flowered cymules (with the lateral flowers bibracteolate), or in small pseudocapitula or, very rarely, in small pseudumbellules (with the bracts arranged in a false whorl). *Calyx* 4-lobed, mostly bilabiate, with either one lip or both lips 2-toothed or emarginate, coriaceous or thin, papery and brittle, scabrid, or pubescent or tomentose, or glabrous and viscid on the outer face, densely adpressedly silky-hairy within (rarely glabrous, or silky-hairy in the upper half only); tube campanulate. *Corolla* 4-lobed; tube cylindric, as long as, or somewhat shorter than the calyx-tube, circumscissile above the persistent base, with the throat closed by a dense growth of deflexed, at length more or less erect, bristly white hairs; lobes white or creamy, strongly reflexed over the upper part of the calyx, very frequently cucullate at the apex and with a

small subapical callo-sity (nectary?) on the inner face, usually adpressedly silky-hairy on the outer face. *Stamens* 4; filaments wholly exserted, inserted on the corolla throat between the lobes and always longer than these; anthers 2-thecous, with the thecae confluent at the apices, cordate-reniform, at length strongly divergent. *Ovary* obovoid, 2-locular, with axile placentation and with numerous ovules in each loculus, silky white hairy in the upper half, rarely quite glabrous; style terminal, very much exserted from the corolla tube and as long as, and often overtopping the filaments; stigma terminal, truncate. *Fruit* a 2-valved septicidal capsule, slightly exserted from, sometimes included in the persistent calyx, usually densely adpressedly silky-hairy. *Seeds* oblong, numerous, small.

Species about 40 or more. Natives of Africa or Madagascar, with two species described from the Comoro Islands.

Type species: *Lachnopylis congesta* (R.Br. ex Fres.) C. A. Sm.

The species are widely distributed in Africa, though absent from the Karroo region of South Africa, and are specially abundant in Tropical Africa. The taller species, which are often up to 15 metres high, enter very largely into the composition of forests, e.g. *L. emarginata* (Sond.) and *L. floribunda* (Benth.), in the Eastern and South Eastern regions of South Africa, the former often growing in almost pure stands in some places (Transkeian Conservancies); or, in the case of the dwarf species, act as pioneers on bare rocky outcrops (in the fissures), e.g. *L. montana* C. A. Sm. on the quartzite outcrops of the Magaliesberg and hills round Pretoria, and *L. breviflora* (S. Moore) on the northern escarpment of the Witwatersrand series near Johannesburg, Transvaal; or, as in the case of *L. oppositifolia* Hochst., frequent the banks of water courses and streams, e.g. in Angola, the Eastern Transvaal, Natal, etc.

Furthermore, some species yield good timber, though this is surpassed in quality by that of other indigenous woods.

As circumscribed in this paper, the genus may be divided into three more or less natural series according to the particular arrangement of the flowers on the inflorescence branches. Thus:—

1. LAXIFLORAE—Flowers subsessile or pedicelled, arranged in 3-*flowered* cymules at the ends of the *tertiary or further branches* of the inflorescence, with each of the *lateral flowers bibracteolate* (Fig. 2, A).

2. GLOMERULATAE—Flowers usually sessile, more rarely pedicelled, contracted into *several to many-flowered pseudocapitula or pseudumbellules* at the ends of the *secondary or further branches* of the inflorescence, with the *bracts disposed in a false whorl* (Fig. 2, B_2, C).

3. SPHAEROCEPHALAE. Flowers sessile, aggregated into *several to many-flowered compact globose pseudocapitula* terminating the *primary* (*or, occasionally, the secondary*) *branches* of the inflorescence, with the *bracts much reduced and enclosed* within the "heads" (Fig. 2, D_1, D_2).

Series 1. LAXIFLORAE *C. A. Sm.*

To this series belong the majority of the African species and a few of the Malagasy and Comoran species generally referred to *Nuxia*, among which may be mentioned* :—

L. congesta (*R. Br. ex Fres.*), comb. nov.—*Nuxia congesta* R. Br. in Salt, Abyss. App. 63 (1814), nomen. & ex Fres. in Flora, xxi. 2, 606 (1838), descr.—Abyssinia.

L. floribunda (*Benth.*), comb. nov.—*N. floribunda* Benth. in Hook. Comp. Bot. Mag. ii. 50 (1836). Extends from the George Division of the Cape to Natal, the Eastern Transvaal and north to Tanganyika.

L. pubescens (*Sond.*), comb. nov.—*N. pubescens* Sond. in Linnaea xxiii. 84 (1850).—Transvaal Highveld.

L. emarginata (*Sond.*), comb. nov.—*N. emarginata* Sond. loc. cit. 83.—South Eastern Cape to the Eastern Transvaal.

L. tomentosa (*Sond.*), comb. nov.—*N. tomentosa* Sond. loc. cit. 84.—Transvaal Highveld.

L. breviflora (*S. Moore*), comb. nov.—*N. breviflora* S. Moore in Journ. Bot. xli. 403 (1903).—Transvaal Highveld.

L. heterotricha *C. A. Sm.*, sp. nov. (see p. 28).—Southern Bechuanaland.

L. oppositifolia *Hochst.* in Flora, xxvi. 77 (1843). Tropical Africa, Eastern Transvaal, Natal.

L. viscosa (*L. S. Gibbs*), comb. nov.—*N. viscosa* L. S. Gibbs in Journ. Linn. Soc. Bot. xxxvii. 454 (1906).—Southern Rhodesia.

L. sambesina (*Gilg*), comb. nov.—*N. sambesina* Gilg. in Engl. Pflanzenw. Ost-Afr. C. 312 (1895).—Tanganyika.

L. speciosa *C. A. Sm.*, sp. nov. (see p. 29).—Natal.

L. saxatilis *C. A. Sm.*, sp. nov. (see p. 27).—Natal.

Series 2. GLOMERULATAE *C. A. Sm.*

The following African species belong here :—

Flowers pedicelled :

L. gracilis (*Engl.*), comb. nov.—*Nuxia gracilis* Engl. in Engl. Bot. Jahrb. x. 243 (1888).—Griqualand West.

*Only the names are here changed of those species which occur in South Africa or are referred to in this paper.

Flowers sessile :

L. glomerulata *C. A. Sm.*, sp. nov. (see p. 24).—Western Transvaal.

L. polyantha (*Gilg*), comb. nov.—*N. polyantha* Gilg in Engl. Bot. Jahrb. xxx. 376 (1901).—Tanganyika.

L. suaveolens *C. A. Sm.*, sp. nov. (see p. 23).—Western Transvaal.

The majority of the other Malagasy species currently referred to *Nuxia* also belong to this series.

(N.B. *Nuxia scytophylla* Baker, loc. cit., must be referred to another genus in *Loganiaceae*, probably constituting an undescribed genus by itself.)

Series 3. Sphaerocephalae *C. A. Sm.*

This series is constituted only by the following three species from Madagascar :—

L. sphaerocephala (*Baker*), comb. nov.—*Nuxia sphaerocephala* (Baker) Baker in Journ. Linn. Soc. Bot. xxii. 505 (1887).

L. terminalioides (*Baker*), comb. nov.—*N. terminalioides* Baker, loc. cit.

L. pachyphylla (*Baker*), comb. nov.—*N. pachyphylla* Baker, loc. cit. 506 ; pro majore parte.

The type of inflorescence-branching in the above three species is not always evident from first inspection. Thus, in Fig. 2, D_3, which shows a part of the inflorescence (one branch) of a specimen of *L. sphaerocephala* (Baker), the dichasial pattern is entirely obscured, and it is only by the examination of a series of specimens that the dichasial nature is revealed (as in *L. sphaerocephala*), by the presence of occasional didymous heads (Fig. 2, D_2), or, more rarely, by occasional dichotomous secondary branches terminating in pseudocapitula (Fig. 2, D_1).

Since the general consensus of opinion favours the view that a congested arrangement of the flowers, such as occurs in many *Rubiaceae*, *Dipsacaceae*, *Umbelliferae*, all *Compositae*, etc., marks a high evolutionary stage, there seems to be little reason to doubt that, as regards the inflorescence, the *Sphaerocephalae* are the highest evolved and the *Laxiflorae* the most primitive in the genus *Lachnopylis*.

On this basis it may reasonably be assumed that the *Glomerulatae* occupy an intermediate position between the former two series, and the probable course of evolution in the inflorescence may be represented diagrammatically as shown in Fig 2.

Fig. 2, A represents a lateral branch of the inflorescence of one of the *Laxiflorae*. Suppression of the quaternary and then of the

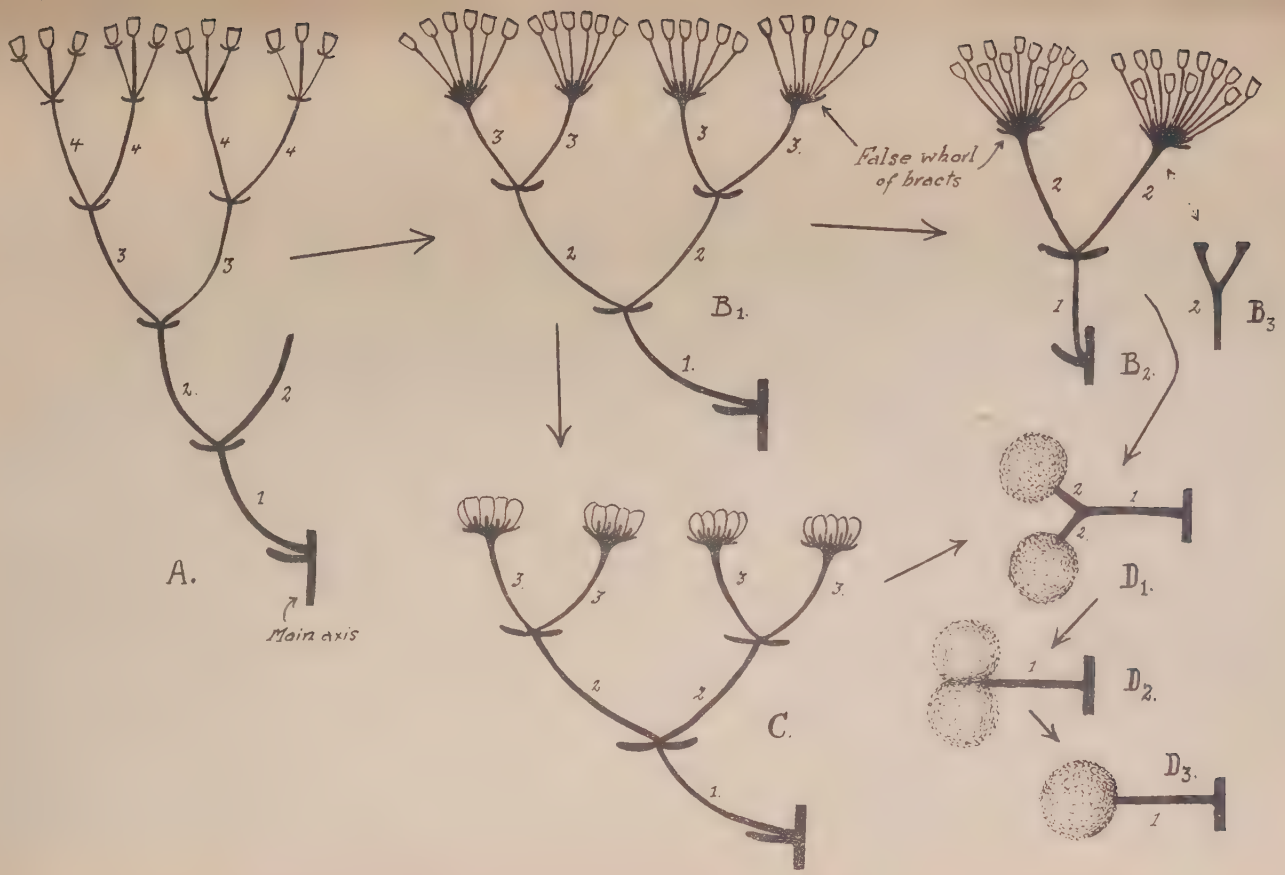

FIG. 2. Lateral branches of the inflorescence in *Lachnopylis*. A, *L. montana* C. A. Sm.; B_1, Hypothetical stage (*Glomerulalae*); B_2, *L. gracilis* (Engl.); B_3, Dichotomy in a secondary branch of *L. gracilis* (Engl.); C, *L. glomerulata* C. A. Sm. showing sessile flowers and false involucre; D_1—D_3, Various stages in *L. sphaerocephala* (Baker). Diagrammatic.

tertiary branches of the rhachis would, through an intermediate hypothetical stage B_1, result in the condition shown in B_2, actually found in *L. gracilis* (Engl.). In this species the little pseudumbellules represent condensed dichasial cymes, of which the dichotomous branches may often be seen (owing to incomplete fusion), e.g. in *Burchell* 1827 (in Herb. Kew), which certainly belongs to this species (B_3). By the disappearance of the pedicels in the last stage, the condition D_1 (casual in *L. pachyphylla* and very rare in *L. sphaerocephala*) would be reached, and a subsequent suppression of the secondary axes would then lead to the formation of the didymous pseudocapitula shown in D_2 (very casual in *L. sphaerocephala*), or the apparently simple pseudocapitulum in D_3, characteristic of the last species.

The condition D_1 might alternatively be reached through stage C (exemplified by *L. glomerulata*). This stage itself may have been derived from stage A through B_1 by suppression of the pedicels of the latter. Suppression of the tertiary axes would then lead to the condition D_1 as suggested above.

The close grouping of the flowers demanded by the above processes, must of necessity be followed by a corresponding decrease in their size, or, alternatively, if the size be maintained as relatively constant, a reduction in the number of flowers in the ultimate pseudocapitula must follow. It is of interest to note that both these conditions are to be observed in the above three series. Thus, in the *Laxiflorae*, the flowers are from 5 to 6 mm. long (excl. the stamens); in the *Glomerulatae* about 2·5–3·5 mm. long (excl. the stamens), and in the *Sphaerocephalae*, less than 2·5 mm. long (excl. the stamens), except in the case of *L. pachyphylla* (Bak.). In that species reduction in the number of flowers forming the globose pseudocapitula is correlated with the retention of the relatively large flowers of the first series.

In concluding this part of the paper, the writer wishes to acknowledge his indebtedness to Dr. T. A. Sprague and Mr. J. Hutchinson of the Kew Staff—the former for constructive criticism on the paper as a whole, the latter for critical advice on, and assistance in the determination of, the Tropical African species of the genus—to Dr. A. B. Rendle, F.R.S., Keeper of Botany, British Museum (Natural History), for facilities to consult Robert Brown's and Spencer Moore's types, and to the Rev. F. A. Rogers, now in Bagdad, Persia, for permission to consult his rich South African herbarium during his absence, four very interesting species being described from that source alone.

The new species described below appear to have been confused in herbaria with other closely allied species of the genus, and since some of these, e.g. *L. pubescens* (Sond.) as delimited in the Flora Capensis, really include two distinct specific groups, the writer has supplied the following tentative key to the South African species, in which an attempt has been made to separate out these species from such

material as could be consulted within the time available. It should be noted that the present paper is not offered as a complete revision, but the key should be regarded as a guide towards distinguishing those of the South African species described below and their allies, while indicating also the possibility of utilising the special character of the indumentum (so far apparently not adequately appreciated) as a means of specific differentiation. (A few types of hairs are shown in Fig. 1, C—J.)

Intensive and extensive collecting of material of these species will show how far the characters utilised may be depended upon in any future revision, and, with this end in view, South African collectors should devote special attention to the genus as represented in the Eastern and North Eastern Transvaal. Material from these parts in the Kew and Rogers herbaria, though too scanty for satisfactory treatment, indicates that several undescribed species of the genus might yet be found. That this is more than likely appears from the fact that this part of the Transvaal is phytogeographically distinct from the rest of the province, and in this connection it may be noted that the majority of the African species of the genus, as far as this has been worked out, are confined to definite phytogeographical areas, and the exceptions are exactly those species [e.g. *L. floribunda* (Benth.) and *L. oppositifolia* Hochst.] which are most isolated in the genus.

Key to the South African species of *Lachnopylis*:

Flowers grouped in 6- many-flowered terminal pseudocapitula or pseudumbellules:
  Flowers sessile:
    Lateral inflorescence-branches at first 2–3 times racemosely divided, at length dichasial.....1. *suaveolens*.
    Lateral inflorescence-branches dichasially divided.....2. *glomerulata*.
  Flowers distinctly pedicelled.....3. *gracilis*.
Flowers arranged in terminal 3-flowered cymules:
  †Leaves, young stems and inflorescences quite glabrous in all parts:
    Leaves opposite, never whorled.....4. *oppositifolia*.
    Leaves ternately whorled, casually opposite only along the very young shoots:
      Inflorescence ample and elongated; calyx chartaceous, glabrous (rarely only thinly hairy) within; ovary glabrous.....5. *floribunda*.
      Inflorescence congested; calyx coriaceous, densely adpressedly silky-hairy within; ovary silky-hairy in the upper half:
        Calyx swollen above the base around the ovary, keeled along the teeth; petals without a subapical callosity...6. *saxatilis*.
        Calyx never dilated at the base around the ovary, not keeled; petals with a subapical callosity:

Leaves elliptic, tapering to the apices, markedly viscidulous, generally with more or less toothed margins, always drying green.....7. *viscidulosa*.

Leaves oblong-obovate or obovate, not (or only very slightly) tapering towards the apices, never viscidulous, with entire margins and drying reddish- to chocolate-brown.....8. *emarginata*.

+Leaves, young stems and inflorescences always with a distinct pubescence (rarely, as in *L. emarginata* var. *brevifolia*, confined only to the inflorescence) :

Indumentum composed of simple hairs only (rarely with a few scattered stalked stellate hairs) :

Indumentum on both sides of the leaves composed of stipitate glands sometimes intermixed with longer soft non-glandular simple hairs :

Leaves broadly oblong to suborbicular, up to 3 cm. long and 2·5 cm. wide, rounded or subtruncate at the base, with very short (at most 3 mm. long) petioles ; mature calyces at most 2·5 mm. long and 2 mm. wide ; inflorescence never more than 5 cm. in diam. at maturity..... 9. *heterotricha*.

Leaves obovate to oblong-elliptic, up to 4 cm. long and 2 cm. wide, distinctly cuneate at the base into the 4 to 6 mm. long petiole ; mature calyces never less than 4·5 mm. long and 1·5 mm. wide ; inflorescence never less than 7 cm. in diam. at maturity.....10. *pubescens*.

Indumentum (on lower face of the leaves only) composed of long fine eglandular hairs, sometimes with a few stalked stellate hairs intermixed.....11. *speciosa*.

Indumentum always (except sometimes on the calyces) composed of stalked stellate or dendritic hairs, sometimes with a few simple hairs intermixed, never glandular in function :

Leaves densely tomentose on both sides with more or less shaggy hairs :

Calyx at most 2 mm. long ; leaves with stalked stellate hairs, occasionally mixed with a few dendritic hairs ; inflorescence up to 3 cm. in diam. at maturity..... 12. *breviflora*.

Calyx at least 4 mm. long ; leaves with long shaggy dendritic hairs ; inflorescence from 7·5 cm. to 10 cm. diam. at maturity.....13. *tomentosa*.

Leaves with shorter less evident pubescence, never tomentose or shaggily hairy on both sides :

Leaves drying reddish-brown or brown, glabrous and shiny above (occasionally very thinly pubescent above) ; inflorescence up to 4·5 cm. in diam. at maturity :

Leaves elliptic to oblong-elliptic, up to 7 cm. long and 3·5 cm. wide, acute or subacuminate at the apices; leaf-margins very generally toothed...14. *schistotricha*.

Leaves oblong-obovate to obovate-cuneate, up to 2·5 cm. long and 1 cm. wide, very slightly narrowed to the very obtusely rounded apices; leaf-margins entire.....8a. *emarginata* var. *brevifolia*.

Leaves always drying green, usually densely (though shortly) pubescent on both sides; inflorescence up to 9 cm. in diam. at maturity.....15. *montana*.

1. **L. suaveolens** *C. A. Smith*, sp. nov.; affinis *L. glomerulatae* C. A. Sm., a qua inflorescentia iterum nec semel racemose ramosa necnon partibus novellis dense pilosis differt.

A small shrub to 90 or 120 cm. high, with moderately stout ascending branches; branchlets closely leafy and more or less angled, densely pilose in the young parts, at length glabrous. *Leaves* ternately whorled, casually opposite along the very young shoots, oblong-obovate to obovate, up to 5 cm. long and 1·7 cm. wide, cuneate in the lower half into a distinct petiole up to 7 mm. long, coriaceous, dark green and prominently reticulated above, paler and prominently reticulated below, with the flat or subrevolute margins distinctly 1–6-toothed on either side of the rounded to subacute and abruptly mucronulate apex, densely silky-hairy in the young stages with long more or less adpressed hairs (especially along the midrib, margins, petiole and leaf-buds), soon glabrous and viscidulous. *Inflorescence* densely many-flowered, more or less pyramidal, up to 9 cm. long and 8 cm. in diam., copiously branched, with the branches angled and pubescent; each lateral branch of the main axis at first racemose and terminating in 2–3-furcate dichasia, with the primary branches of the raceme again racemosely branched and the secondary branchlets thus formed breaking into 1–2-furcate dichasia, or with the primary branches of the raceme immediately giving rise to 2 3-furcate dichasia; lowermost branches arising singly or in pairs in the axils of the uppermost bract-like leaves; rameal bracts linear-subulate, pubescent. *Flowers* sweet-scented (*Hutchinson*), collected into terminal 6–15-flowered pseudocapitula surrounded by their short linear-pubescent bracts. *Calyx* campanulate, 4-toothed, up to 2 mm. long and 1 mm. wide, shiny and chartaceous, brittle, glabrous without, shortly adpressedly hairy in the upper, glabrous in the lower, half of the tube within. *Corolla lobes* narrowly oblong, cucullate at the apex and with a small subapical callosity, glabrous on the outer face.

Western Transvaal. Marico Div.: open slopes of hills above Zeerust, 1200 m., Feb., March, *Rogers* 20369 ! (type, Pa), *Hutchinson* 2950 ! (syntype, K, Pa).

This species is most readily recognised by the branching of its inflorescence, which is of interest further as showing occasional (descending) serial branching.

2. **L. glomerulata** *C. A. Smith*, sp. nov. ; affinis *L. polyanthae* (Gilg) et *L. gracili* (Engl.), ab illa foliorum forma et floribus minoribus, ab hac foliis latioribus integris vel versus apicem paucidenticulatis floribus sessilibus recedit.

An arborescent shrub or small tree about 3 m. high. *Branchlets* closely leafy, terete, becoming angled towards the apices, closely pubescent, at length glabrescent. *Leaves* ternately whorled, petioled, oblong-elliptic to obovate, always strongly cuneate towards the base, up to 4·5 cm. long and 1·4 cm. wide, coriaceous, deep green above, paler and prominently 1-nerved on the lower face, closely reticulated on both surfaces, rounded, casually emarginate, or obtuse and mucronulate at the apex, with entire (or, in the upper half, casually and minutely denticulate) subrevolute margins, glabrous except for the midrib below from where the pubescence of simple hairs is continued along the 5–7 mm. long petiole. *Inflorescence* up to 9 cm. long and 6·5 cm. in diam., with long internodes between the branches ; the latter 2–3-times furcate, angled and pubescent, especially along the nodes, with the lower branches arising from the axils of the upper bract-like leaves, and with the ultimate branchlets terminated by a compact pseudocapitulum of about 9–15 sessile flowers surrounded by a false whorl of short narrow linear-subulate bracts ; rameal bracts linear or subulate, about 2 mm. long, more or less densely pubescent. *Calyx* campanulate (sometimes subcylindric in bud), 3·5 mm. long and 1·5 mm. wide, thin and membranous, 4-toothed at the apex, glabrous without, closely adpressedly silky-hairy within in the upper half of the tube, glabrous lower down ; teeth subobtuse or rounded, mucronulate. *Corolla lobes* oblong-elliptic, without a small callosity near the apex, glabrous on the outer face.

Western Transvaal. Rustenburg Div. : Zwartruggens, 1350 m., Feb., *D. Fouche* 9 ! (Pa, K).

3. **L. gracilis** (*Engl.*) *C. A. Smith*, comb. nov.

Nuxia gracilis Engl. in Engl. Bot. Jahrb. x. 243 (1888).

Griqualand West. Hay Div. ; (sine loc. exact.), on rocky slopes, 1220 m., Feb., *Marloth* ! sine num. (type, Be, K). Herbert Div. : Upper Campbell, Nov., *Burchell* 1827 ! (K) ; Lower Campbell, Nov., *Burchell* 1817 ! (K).

4. **L. oppositifolia** *Hochst.* in Flora, xxvi. 77 (1843, descr., & in Herb. Schimp. Abyss. iii. n.1714 (U. i. 1844), nom. sol. ; A.DC. in DC. Prodr. ix. 23 (1845).

N. dentata R.Br. in Salt, Abyss. Append. 63 (1814), nom. sol., & ex Benth. in DC. Prodr. x. 435 (1846), desc. ; A. Rich. Tent. Fl. Abyss. ii. 124 (1851) ; Engl. Hochgebirgsfl. Trop. Afr. 335 (1892), incl. var. *glutinosa* Engl. loc. cit. ; Gilg in Engl. Pflanzenw. Ost-Afr. C. 312 (1895) ; Hiern, Cat. Afr. Pl. Welw. iii. 700 (1898) ; Gilg in Warb. Kun.-Samb. Exped. 331 (1903) ; S. Moore in Journ. Bot. xli. 403 (1903), excl. var. *transvaalensis* S. Moore, loc. cit. ; Baker in

Dyer, Fl. Trop. Afr. iv. i, 513 (1904) ; Di Capua in Pirot, Fl. Erit. 2, 211 (1904) ; Burtt Davy in Kew Bull. 162 (1908) ; Prain & Cummins in Dyer, Fl. Cap. iv. i, 1040 (1909) ; Fiori in L'Agric. Coll. v. Suppl. 78, f.145A (1911), & Boschi E Piante Leg. Erit. 302 (1912) ; Eyles, Rec. Pl. S. Rdsia. 442 (1916) ; Sim, Native Timbers of S. Afr 89 (1921) ; Broun & Massey, Fl. Sudan, 241 (1929).

Nuxia oppositifolia Benth. in DC. Prodr. x. 435 (1846) ; Wood, Revised List Fl. Nat. 191 (1908) ; Sim, For. Fl. Port. E. Afr. 90, 127, t.77, f.B (1909).

N. Schlechteri Gilg in Engl. Bot. Jahrb. xxxii. 140 (1902).

N. Antunesii Gilg in Thon. Blütenpfl. Afr. t.128 (1908).

South Eastern Region. Natal : (sine loc. exact.), *Gerrard* 716 ! (K), sine num.! (K), near the Nonoti River, May, *Wood* 3878 ! * (K). Zululand : (sine loc. exact.), 60 m., Dec., *Haygarth in Herb. Wood* 7399 ! (BM).

Eastern Transvaal. Barberton Div. : Komati Poort, 200 m., Dec., *Schlechter* 11738 ! (type of *N. Schlechteri* Gilg, BM, K, Z), *Rogers* 22191 ! (R).

Transvaal Bushveld. Zoutpansberg Div. : Shilouvane Dec., Jan., *Junod* 1430 ! (K, Z) ; Messina, 600 m., Dec., *Rogers* 20700 ! (R)

Widely distributed in Tropical Africa.

" Timber reddish-yellow, up to 30 cm. diam., seldom sound, not scented, with a dense fibre and prettily streaked, useful for furniture, etc." *Sim.*

Engler (loc. supra cit.), makes a var. *glutinosa* on the viscidulous character of the leaves of his specimens, but from the fact that this viscidulous secretion is fairly general in the genus, especially among the glabrous species, it would seem to be a seasonal phenomenon most in evidence at the time of flowering.

The plant (*Rand* 1132, collected near Johannesburg) described by Spencer Moore, loc. supra cit., as *N. dentata* var. *transvaalensis* appears to be a distinct species, agreeing much more closely with *L. breviflora* (S. Moore) in the texture and dark impressed lateral nerves of the leaves. From the latter species it is, however, known by its much narrower and glabrous leaves. Fuller material is required for a detailed specific diagnosis.

5. **L. floribunda** (*Benth.*) *C. A. Smith*, comb. nov.

Nuxia floribunda Benth. in Hook. Comp. Bot. Mag. ii. 59 (1836), & in DC. Prodr. x. 435 (1846) ; Pappe, Silva Cap. Ed.2, 30 (1862) ; Fourcade, Rep. Natal For. 115 (1889) ; Wood & Evans, Natal Pl. i. 48, t.59 (1899) ; Sim, For. Fl. Cape Col. 274, t.157 (1907) ; Prain & Cummins in Dyer, Fl. Cap. iv. i, 1039 (1909) ; Sim, Flow. Trees & Shrubs in S. Afr. 178 (1919), & Native Timbers of S. Afr. 89 (1921).

* Wood seems accidentally to have distributed specimens of his plant as No. 3578, but in his "List" the number is correctly cited as 3878, the former number belonging to a different plant altogether.

Chilianthus triphyllus E. Mey. in Drège, Zwei Pfl. Doc. 172 (1843), nom. sol.

N. usambarensis Gilg in Engl. Glied. Veg. Usamb. 63 (1894), & in Engl. Pflanzenw. Ost-Afr. C. 312 (1895).

N. floribunda var. *Holstii* Gilg in Engl. Glied. Veg. Usamb. 54 (1894).

N. Holstii Gilg in Engl. Pflanzenw. Ost.-Afr. C. 312 (1895); Baker in Dyer, Fl. Trop. Afr. iv. i, 515 (1904).

N. Volkensii Gilg in Engl. Pflanzenw. Ost-Afr. C. 312 (1895).

South Western Region. George Div.: forest near George, Aug.–Oct., *Prior*! (K), *Schimper*! (Z); Outeniqua Mountains, Montagu Pass, *Rehmann* 208! (Be, Z). Knysna Div.: in the forests at Knysna, Nov., *Marloth* 2575! (Be), *Bolus* 2145! (K); Kaatjes Kraal, near Yzer Nek, April, *Burchell* 5240! (K); between the Keurbooms River and Bietouw River, April, *Burchell* 5295! (K); in woods at Plettenbergs Bay, Oct., *Rogers* 15468! (R), *B. Smart in Herb. Rogers* 27889! (R), sine num. *Mund & Maire*! (Be, K), *Niven* 119! (BM), *Bowie* 6! (BM); Knysna forest, June, *Burchell* 5448! (Be, K); near the Knysna River ford, July, *Burchell* 5537! (K). Humansdorp Div.: near Humansdorp, Aug., *Rogers* 2843! (BM, R); in the forest at Witte Els Bosch, 230 m., Aug., *Fourcade* 844! (K); Storms River Forest, in the T'zitzikamma, 150 m., Sept., *Galpin* 4333! (K); in Coast Forest at Ratelsbosch, 200 m., Oct., *Fourcade* 507! (R); between the Gamtoos and Kromme Rivers, *Drège* 3524a! (Be, BM, K). Uitenhage Div.: between van Staadens River and Galgebosch, Feb., *Burchell* 4673! (K); in the Zwart Kops River Valley, 15–30 m., sine num., *Zeyher*! (Be); on the Zwartkops River banks and in ravines of the van Staadens Berg, *Zeyher* 115! (BM, K); on the Zwartkops River, sine num., *Ecklon*! (type, Be); on the van Staadens Berg, Sept., *Mrs. T. V. Paterson* 723! (Z); near Uitenhage, Dec., *Burchell* 4241! (Be, K). Port Elizabeth Div.: on the Krakakamma, sine num., *Zeyher*! (K); near Port Elizabeth, *Miss West* 63! (K).

South Eastern Region. Albany Div.: near the Great Fish River, *Masson*! (BM). Transkei, "Mamibi Station," Sept., *Forest Officer in Herb. Austro-Afr.* 870! (Z). Pondoland, Lusikisiki Div.: between the Umsamwubo and the Umsikaba Rivers, in shady ravines near the big waterfall, under 300 m., May, *Drège* 3524b! (Z). Natal, Alexandra Div.: at Dumisa, along the Umgaye, 600 m., June, *Rudatis* 1015! (Be, BM, K, Z); "Fairfield", 750 m., *Rudatis* 95! (Be); "Umkomanzi River district", in sandy rocky soil, July, *Wheeler*! (Z). Durban Div.: in woods at Berea, 45 m., May, *Wood* 7183! (Be, BM). Inanda Div.: Inanda, July, *Wood* 980! (K); hills near the Illovo River, June, *Gerrard* 1893! (K). Western Zululand (sine loc. exact.), April, *Baker in Herb. Evans* 528! (K); *Gerrard* 1893! (BM). Eshowe Div.: at Eshowe, Sept., *Rogers* 24459! (R).

Eastern Transvaal. Barberton Div.: at Barberton, *Thorncroft* 736! (BM).

Transvaal Bushveld. Pietersberg Div.: near Haenertsburg, Feb., *Legat* 122! (BM, R); The Downs, Nov., *Rogers* 21976! (R). Zoutpansberg Div.: Louis Trichardt, June, *Rogers* 21172! (R).

Extends north as far as Tanganyika.

Common names: *Wilde Vlier Boom, Bosvlier, Vlier, Wild Elder.*

"A very hard wood of a brownish-purple and an inconspicuous but rather pretty grain. It saws freely for so hard a wood and planes fairly well. It recalls the best boxwood in turning, as it is just as hard and the surface is just as good, but the grain is coarser. It takes a good finish, but the colour is considerably altered in the polishing. It is a very good turner's wood....." *Stone.*

6. **L. saxatilis** *C. A. Smith*, sp. nov.; affinis *L. emarginatae* (Sond.), a qua angustiore longioreque tubo calycis, corollae lobis sub apicem sine calloso differt.

A tall tree from 10 to 15 m. high; branchlets closely leafy, terete, angled in the younger parts, glabrous. *Leaves* in ternate whorls, petioled, obovate often very strongly cuneate to the base, rounded and mucronate or emarginate at the apex, coriaceous, dark green above, paler below, with entire flat to subrevolute margins, glabrous. *Inflorescence* compactly rounded and densely many-flowered, glabrous in all parts; branches fastigiate, angled, with small much reduced bracts. *Flowers* shortly pedicelled or subsessile. *Calyx* campanulate, more or less 4-angled in the upper half owing to the decurrent keels on the lobes, up to 5 mm. long and 1·5 mm. wide. *Corolla lobes* oblong, obtuse and cucullate at the apices, without a subapical callosity, glabrous on the outer face. *Fruit* obovoid, densely adpressedly silky-hairy, slightly exserted from the calyx.

Natal. Paul Pietersburg Div.: Bevaan Falls, July, *Wood* 3190! (K). Alexandra Div.: Ellesmere, on sunny krantz slopes, 600 m., *Rudatis* 1399! (type, K, Pa).

7. **L. viscidulosa** *C. A. Smith*, sp. nov.; affinis *L. pubescenti* (Sond.) et *L. emarginatae* (Sond.); ab illa foliis calycibusque glabris, ab hac foliorum forma recedit.

An arborescent shrub up to 5 m. high; branchlets closely leafy, angled in the young parts, glabrous throughout. *Leaves* in ternate whorls, petioled, elliptic, up to 6 cm. long and 3 cm. wide, thinly subcoriaceous, generally a bright green in colour above and below, with flat entire or (very frequently) more or less distantly and shallowly crenate-dentate margins, cuneate toward the base into the 3–7 mm. long glabrous petiole, gradually tapering to the acute to subobtuse or more or less rounded apices, closely glandular-punctate and with a copious viscid secretion during the flowering period, glabrous. *Inflorescence* lax, up to 5·5 cm. long and 7 cm. in diam., with the branches 2–3 times furcate, glabrous in all parts (rarely faintly puberulous along the younger branchlets); upper rameal bracts obovate to spatulate, at length much reduced and linear,

glabrous; the lower foliaceous, elliptic to spatulate, up to 2·5 cm. long and 1 cm. wide. *Flowers* manifestly pedicelled. *Calyx* subcylindric to campanulate (obovoid in bud), up to 5 mm. long and 1·5 mm. in diam., viscidulous and glabrous. *Corolla lobes* oblong, more or less cucullate at the apex and with a distinct subapical callosity, silky-hairy on the outer face. *Fruit* silky-hairy (at least in the upper part), about as long as, or included by, the calyx.

Transvaal Highveld. Witwatersrand Div.: Witpoortje Kloof, 1800 m., Aug. Oct., *Rogers* 19220! (type, Pa, R), *Moss* 2476! (R); Johannesburg koppies, 1750–1850 m., Aug., *Moss* 2475! (R, Pa); Orange Grove, Johannesburg, Nov., *Rogers* 22362! (R). Pretoria Div.: "Near Pretoria", *Kirk* 30! (K).

8. **L. emarginata** (*Sond.*) *C. A. Smith*, comb. nov.

Nuxia emarginata Sond. in Linnaea, xxiii. 84 (1850).

N. congesta var. *emarginata* Prain in Dyer, Fl. Cap. iv. i, 1042 (1909).

South Eastern Region. Bathurst Div.: on the banks and to the east of the Kowie River, under 150 m., Nov., *Ecklon & Zeyher*! (type, Be); near Port Alfred, Oct., *Burchell* 4026! (K); between the mouths of the Great Fish and Riet Rivers, 90 m., Nov., *MacOwan* 297! (Pa); near Bathurst, 150 m., Nov., Dec., *MacOwan* 297! (Z). East London Div.: woods near East London, 150 m., March, April, *Flanagan* 94! (Z), *O. Kuntze*! (K). Natal, Inanda Div.: Inanda, *Wood* 576! (K).

Central Region. Somerset East Div.: near Somerset East, *Bowker*! (BM, K).

Eastern Transvaal. Barberton Div.: summit of the Saddleback Mountain, near Barberton, 1500 m., May, *Galpin* 946! (K, Pa).

Thus is the "*N. congesta*" of many authorities to a greater or less extent, since *L. savatilis* may have been included by them also.

8a. **L. emarginata** var. **brevifolia** (*Sond.*) *C. A. Smith*, comb. nov.

Nuxia congesta var. *brevifolia* Sond. in Linnaea, xxiii. 83 (1850).

Transvaal Highveld. Pretoria Div.: on the Magaliesberg, 1500–1850 m., June, *Zeyher* 1327! (type, BM, K); Koedoespoort, near Pretoria, *Rehmann* 4068! (K); hills near Pretoria, Sept., *McLea in Herb. Bolus* 3102! (K).

The affinity of this variety is with *L. emarginata* (Sond.) with which it agrees in the texture and general shape of the leaves, but differs in its smaller inflorescence and the presence of stalked stellate hairs on the lower surface of the leaves. It is not synonymous with *L. pubescens* (Sond.), as cited by Prain & Cummins (Fl. Cap. iv. i, 1041), for it differs from this species in its pubescence of stalked stellate hairs.

9. **L. heterotricha** *C. A. Smith*, sp. nov.; affinis *L. breviflorae* (S. Moore) et *L. viscosae* (Gibbs); ab illa pubescentia simplice e glandulis stipitatis composita facile distinguitur, ab hac omnibus partibus minoribus multo recedit.

A small shrub, about 2 m. high, with the branchlets closely leafy, terete, striate or angled along the densely glandular hairy younger parts. *Leaves* ternately whorled, casually opposite along the very young shoots, petioled (with the petiole up to 1·5 mm. long and densely pubescent with stalked glands), broadly oblong elliptic to suborbicular, up to 3 cm. long and 2·5 cm. wide, subcoriaceous, pale green and concolorous, with reddish impressed (not raised) lateral nerves and reticulations, rounded to obtuse at the apex, rounded to subtruncate at the base, with entire or casually crenate dentate flat or subrevolute margins, densely pubescent on both surfaces with two sets of hairs one set of short stipitate glands, and one set of longer simple hairs especially prominent along the midrib below and on the petioles. *Inflorescence* more or less compact and rounded, up to 2·5 cm. long and 5 cm. in diam., very densely pubescent in all parts with slender stipitate glands and simple hairs; branches 2- to 3-furcate, strongly angled, bearing much reduced bracts. *Flowers* sessile or up to 2 mm. long pedicelled. *Calyx* more or less cup-shaped (obovoid in bud), up to 3 mm. long and 2 mm. wide, densely pubescent, viscidulous. *Corolla lobes* broadly oblong, cucullate at the apex, but without a small subapical callosity on the inner face, thinly hairy on the outer face. *Fruit* subexserted from the calyx, adpressedly silky-hairy.

SOUTHERN BECHUANALAND. Lobatsi, 1200 m., Oct., *Rogers* 6213 ! (type, Pa, R).

10. **L. pubescens** (*Sond.*) *C. A. Smith*, comb. nov.

Nuxia pubescens Sond. in Linnaea xxiii. 84 (1850); Prain & Cummins in Dyer, Fl. Cap. iv. i, 1041 (1909), pro minima parte.

TRANSVAAL HIGHVELD. Pretoria Div.: on the Magaliesberg, 1500–1850 m., June, *Zeyher* 1326 ! partim (type, BM, K, Pa), *Burke* 259 ! (BM, K).

See note under *L. montana* C. A. Sm. (No 15).

11. **L. speciosa** *C. A. Smith*, sp. nov.; affinis *L. tomentosae* (Sond.) et *L. sambesinae* (Gilg); a quibus pilis foliorum plerumque simplicibus distinguitur.

A tall shrub or tree; branchlets usually closely leafy, frequently with the floriferous shoots ternately whorled, striate or angled along the closely pubescent young parts, at length terete. *Leaves* ternately whorled, casually opposite along the youngest shoots, petioled (the petiole from 2 to 5 mm. long and densely pubescent), oblong-obovate to elliptic, up to 6 cm. long and 2·5 cm. wide, coriaceous, somewhat discolorous, obtuse or rounded at the top, cuneate to the base, with the margins entire and subrevolute, softly pubescent on the lower face (never glabrous), with fine spreading hairs and casually interspersed stalked stellate hairs, glabrous above (except sometimes along the somewhat impressed midrib near the base). *Inflorescence* compactly rounded, up to 10 cm. in diam. and 4·5 cm. long; branches 3 4 times furcate, strongly

angled, densely pubescent ; rameal bracts much reduced, narrowly obovate-cuneate to linear, at most 4 mm. long and 1 mm. wide, at length shortly linear-subulate, adpressed to the branchlets. *Flowers* sessile or with pubescent pedicels up to 0·5 mm. long. *Calyx* campanulate and 4-ribbed in the upper two-thirds, up to 6 mm. long and 2 mm. wide, coriaceous, densely pubescent on the outer face with simple spreading hairs, more or less viscidulous. *Corolla lobes* oblong-elliptic, without a small subapical callosity, adpressedly silky-hairy on the outer face. *Fruit* slightly exserted from the calyx, densely adpressedly silky-hairy.

South Eastern Region. Natal, Ismont, 600–700 m., April, *Wood* 1862 ! (Pa, K).

Only two flowering branches of this species have thus far been met with, and, judging from Wood's Revised List of the Flora of Natal, where these are referred to as " Nuxia sp.", this indefatigable collector seems to have collected it only once.

12. **L. breviflora** (*S. Moore*) *C. A. Smith*, comb. nov.

Nuxia breviflora S. Moore in Journ. Bot. xli. 403 (1903) ; Prain & Cummins in Dyer, Fl. Cap. iv. i, 1041 (1909).

Transvaal Highveld. Witwatersrand Div. : on the northern escarpment of the Witwatersrand series, near Johannesburg, *Rand* 712 ! (type, BM); on hills at Orange Grove, Sept., *Moss* 4130 ! (Pa, K).

13. **L. tomentosa** (*Sond.*) *C. A. Smith*, comb. nov.

Nuxia tomentosa Sond. in Linnaea, xxiii. 84 (1850).

N. congesta var. *tomentosa* Cummins in Dyer, Fl. Cap. iv. i, 1042 (1909).

Transvaal Highveld. Pretoria Div. : on the Magaliesberg, 1500–1850 m., June, *Zeyher* 1326, partim (type, not seen), sine num., *Burke* ! (BM) ; Koedoespoort, near Pretoria, on slopes of hills, *Rehmann* 4667 ! (K).

14. **L. schistotricha** *C. A. Smith*, sp. nov. ; affinis *L. sambesinae* (Gilg) et *L. speciosae* C. A. Sm. ; ab illa foliorum forma apiceque et inflorescentia minora, ab hac indumenti indole differt.

A tall tree, with the branchlets closely leafy, terete and glabrous, or angled and closely pubescent along the younger upper part. *Leaves* in ternate whorls, petioled (with the petioles densely pubescent and at most 5 mm. long), elliptic, up to 7 cm. long and 3·5 cm. wide, always markedly tapering to the acute or subacuminate apex, cuneate to the base, coriaceous, dark green above, paler below, with the margins flat and often entire, densely pubescent (subtomentose) on the lower face (especially along the midrib) with soft branched hairs having few to many sometimes forked branches, glabrous above or minutely puberulous in the younger stages. *Inflorescence* compactly rounded, up to 3·6 cm. long and 5 cm. in diam. ; branches 1- to 2-furcate, densely pubescent and angled. *Cymules* 3-flowered, but very densely crowded on the short (up to 1 cm. long) terminal

branches of the rhachis. *Flowers* subsessile or on 1 to 2 mm. long pubescent pedicels. *Calyx* campanulate, up to 4 mm. long and 2 mm. wide, laxly pubescent with short branched and intermixed simple hairs. *Corolla lobes* oblong, cucullate at the apex, without a subapical callosity on the inner face, thinly adpressedly silky-hairy on the outer face.

Eastern Transvaal. Lydenburg Div.: Graskop, 1160 m., July, *Rogers* 23028 ! (type, Pa, R), 23453 ! (R).

A specimen in Herb. Kew., *Eastwood* 5, "Brittlewood," from the Houtbosch, Transvaal (October 1905), is almost an exact match of *Swynnerton* 606 from Melsetter, Rhodesia, and named *Nuxia sambesina* Gilg in Herb. Kew. Neither of the two specimens, however, agrees with typical *L. sambesina* (Gilg) in texture and shape of the leaves and pubescence, but may possibly belong to an undescribed species, being certainly distinct from *L. schistotricha*. Fuller material of the Houtbosch plant will be required for description.

15. **L. montana** *C. A. Smith*, sp. nov.; affinis *L. pubescenti* (Sond.), a qua pilis stipitatis stellatis facile distinguitur.

An umbrageous arborescent shrub or small tree up to 3 or 4 m. high, often with glabrous innovation shoots. *Trunk* up to 15 cm. diam. at the base, tapering gradually upwards to about 5 or 6 cm. diam. below the branches. *Branches* moderately stout, spreading or ascending, leafy towards the apices of the more or less strongly angled and densely stellately pubescent younger branchlets. *Leaves* ternately whorled, casually opposite on the very young shoots, petioled (with the petioles pubescent and up to 7 mm. long), varying from elliptic-subacute to broadly oblong-obovate (more rarely suborbicular) and emarginate at the apex, firm and coriaceous, more or less prominently nerved below, densely gland-dotted, closely pubescent on both surfaces with stalked stellate hairs (or in some examples, glabrescent above), with the margins entire or notched at the apex, or slightly crenate-dentate in the upper half, always distinctly cuneate to the base. *Inflorescence* up to 8 cm. long and 9 cm. in diam., densely many-flowered, with the branches 2 to 4 times furcate, strongly angled and often subtomentose with stalked stellate hairs. *Flowers* subsessile or up to 4 mm. long pedicelled. *Calyx* campanulate, up to 4.5 mm. long and 2 mm. in diam., pubescent (on the outer face) with fine short simple hairs (with occasional intermixed stalked stellate hairs). *Corolla lobes* cucullate at the apex, with a small subapical callosity, adpressedly silky-hairy on the outer face.—*Nuxia pubescens* Prain & Cummins in Dyer, Fl. Cap. iv. i, 1041 (1909), pro majore parte; non Sond.

Transvaal Highveld. Witwatersrand Div.: on ridges and koppies above Johannesburg, 1590 m., Sept., *Moss* 4671 ! (R), 2478 ! (Pa); Klipriviersberg, near Johannesburg, May, *Ommaney* 121 ! (BM); Houghton Ridge, Johannesburg, 1500 m., May, *Burtt Davy* 5247 ! (K). Pretoria Div.: on the Magaliesberg, 1550–1800 m.,

June, *Burke* 259 ! (only as to the top right-hand specimen on the sheet in Herb. Mus. Brit.) ; north ravine at Waterkloof, near Pretoria, on quartzitic outcrops, 1500 m., Aug., *Mogg* 15186 ! (type, Pa, K) ; south slopes of the Magaliesberg at Mountain View, on quartzitic krantz faces and summits, 1550 m., April, *Mogg* 15136 ! (syntype, Pa, K).

L. montana is a very common species on the hills round Pretoria and on the Magaliesberg, where, according to the excellent notes by Mr. A. O. D. Mogg of the Division of Plant Industry, Pretoria, it is found in the fissures of quartzite and chert outcrops, acting as a pioneer species on the bare rock. It flowers sporadically almost throughout the year, being at its best during October.

Up to the present specimens referred to the above species have been variously placed under *L. pubescens* (Sond.) and *L. tomentosa* (Sond.), but apart from several other characters, the nature of the indumentum in the three species is quite sufficient to keep each distinct. In *L. montana* this is composed of relatively short stalked stellate hairs, in *L. pubescens* of stipitate glands mixed with simple non-glandular hairs, and in *L. tomentosa* of longer shaggy dendritic hairs, which are non-glandular.

If these three species are correctly delimited in this paper, it would appear that *L. pubescens* (Sond.) has not been collected again since about 1843 when Burke and Zeyher collected it on the Magaliesberg, while *L. tomentosa* (Sond.) appears to have been collected only once since that date by Rehmann.

III.—CARDAMOMS. I. H. Burkill.

This list of cardamoms is not unlikely to prove useful to students of the Zingiberaceae. A few new names are proposed in it, as it seems necessary to accept *Languas* vice *Alpinia* for the species of Asia which hitherto have been in *Alpinia*, and a new varietal name is desirable under *Elettaria Cardamomum*. Moreover a plea is made for the retention of the name *Amomum* to include the species (excepting species now in *Aframomum*) placed in that genus by Roxburgh and all later botanists, on the ground that if we adhere strictly to the rules of priority in nomenclature, a long, and to most of us unwelcome, series of new names will have to be put forward, the fact being that no Linnean species remains in the genus.

The last statement will be challenged, as Karl Schumann in his monograph of the Zingiberaceae (Engler's Pflanzenreich, iv. 46, 1904, p. 238) ascribed the name " Amomum Cardamon Linn." to the Round Cardamom of Java ; and this it is which Dr. A. S. Hitchcock, using the name correctly as *A. Cardamomum*, proposes to regard as the standard-species for the genus (International Botanical Congress, Cambridge, England, 1930, Nomenclature, Proposals by British Botanists, 1929, p. 114). It is necessary therefore to shew that the name *Amomum Cardamomum* has been transferred from one cardamom-yielding plant to another.

In the Species Plantarum, 1753, pp. 1–2, Linnaeus placed four plants in *Amomum*. These were :—

A. Zingiber, which became *Zingiber officinale* Roscoe, in 1807,

A. Zerumbet, which became *Zingiber Zerumbet* Smith, in 1804,

A. Cardamomum, which became *Elettaria Cardamomum* Maton, in 1811, and

A. Granum-paradisi, which became *Aframomum Granum-paradisi* K. Schumann, in 1904.

The third of these is the important one in this plea ; and it has to be shewn how it became a changeling between 1753 and 1810, having been in 1753 the Malabar cardamom, but in 1810 becoming the round Java cardamom. In 1753 Linnaeus in his Species Plantarum, p. 1, devised its name for the plant which he recognised as giving the Cardamomum minus of the pharmacists, referring to his Materia medica of 1749, and to his Flora zeylanica of 1747. The Materia medica deals with the fruits only, the Flora zeylanica with the plant ; and what is said in the latter is of the greater importance to us. In it he calls the plant *Amomum scapo bracteis alternis laxis caule breviore*, the " ensal " of Ceylon, as given in Burmann's Thesaurus zeylanicus, p. 54, and Hermann's Musaeum zeylanicum, p. 66, and the " elettari " of Rheede's Hortus malabaricus, xi, plates 4, 5 and 6, i.e., Rheede's " elettari (prima) " and " elettari secunda."

" Ensal " and " elettari prima " are undoubtedly conspecific : and " elettari secunda " probably represents the same species, but the drawing is bad. We well know that the plant which gives the Malabar cardamom is called at the present time ensal by the Cinghalese or elettari by the inhabitants of the Malabar coast : and when we consult reliable books of the two centuries before Linnaeus we find that Cardamomum minus is in them invariably the fruit of this plant, though we are told that it was so well-known that to ask for cardamomum was sufficient to procure it ; and that by English pharmacists it might be called Cardamomum verum. Firmly to establish our case, here is a list of references to writings quoted by Linnaeus and others of his time wherein the Malabar cardamom can be without any doubt recognised in figures and descriptions of Cardamomum minus :—

1574, Clusius, Aromatum Hist., p. 99.
1598, Mattioli, Opera, p. 28.
1623, Bauhin, Pinax, p. 413.
1644, Bodaeus a Stapel, Theophrasti de Hist. Comm., p. 1014.
1694, Pomet, Hist. de drogues, p. 41.
1698, Bontius in Piso, De Ind. utriusque Re Nat., p. 126, the detached fruits only.
1699, Morison, Hist. plant., p. 254.
1714, Barrelier ; Plant. icon. exhib., p. 127 and fig. 571, the figures taken from N. Maronea's De Amomo, 1608.
1736, Geoffroy, Treatise on Physick, p. 324.
1760, Trew, Herbarium blackwellianum, iv, plate 385.

It was different with the name " cardamomum majus," which successive writers used in different ways. Cordus used it for grains of paradise ; Clusius used it for the Ceylon or greater cardamom ; Matthioli for grains of paradise ; Bauhin and Bodaeus for the Ceylon cardamom ; Bontius for a species of *Languas* ; Pomet, Morison, Barrelier and Geoffroy for grains of paradise ; and Trew for the Ceylon cardamom.

Pomet, who has been quoted, gave fantastic drawings of the infructescences of the cardamoms in which trifoliolate leaves replace the bracts ; these figures, however, are still useful as being true in other respects. But Bontius muddled the records, by figuring a plant of the Javanese round cardamom as cardamomum minus and a *Languas* as cardamomum majus. " Gloriatur autem Bontius se primum esse qui cardamomum exacte descripsit," wrote Ray (Hist. plant, 1688, p. 1204) ; but it had been better if Bontius had not endeavoured to describe it. Barrelier, later, excluded such Cardamoms as the round Java cardamom from Cardamomum calling them Amomum.

Bontius' mistake led to the one real inaccuracy in Linnaeus' references for his *Amomum Cardamomum*, for by 1747 he had accepted the figure as of his plant, and this acceptance ultimately led to the transfer of the name.

In 1754 Linnaeus identified as many of the plates in Rumpf's Herbarium Amboinense as he could, and ascribed fig. 1 of plate 65 in volume 5 to *Amomum Cardamomum*. Rumpf's text makes it seem probable that he was right ; for Rumpf states that he knew four cardamoms in trade, and one—this one—in life, which had been brought to Amboyna about 1670 via Java, and grew to an undersized plant in the gardens of the town. His figure interpreted by the aid of the text appears to be of a plant of the Malabar cardamom wanting in robustness, the variety of it giving the larger-fruited Ceylon or greater cardamom ; for he contrasted it with a smaller-fruited Malabar cardamom. In 1762 Linnaeus issued the second edition of his Species Plantarum. The same four species were enumerated ; and though the definition of *A. Cardamomum* is slightly altered, there is no change in what Linnaeus meant ; but he passed a misprint and made an error in regard to his citations from Rheede's Hortus Malabaricus, by citing Rheede's Elettari secunda only (plate 6) as *Amomum Cardamomum* and Rheede's Elettari (prima) which is on plate 5, as plate 6 and transferring it to *A. Granum-paradisi*, whereas it is more undoubtedly his *A. Cardamomum* than is Elettari secunda. The error does not invalidate the species. Apparently Linnaeus had transposed these references, and then corrected one of the numbers in partial discovery of this mistake. The third edition of the Species Plantarum, 1764, changes nothing.

Before Willdenow produced his edition of the Species Plantarum in 1797, several species had been added to *Amomum*. Sonnerat had described the Malabar Cardamom again, but under a new name

A. repens (Voyage aux Indes Orientales, v., 1782, p. 272). Koenig (in Retzius, Obs. 3, 1783), Thunberg and Loureiro had added, Thunberg a Zingiber and the others certain obscure species. Willdenow incorporated them. He re-defined *A. Cardamomum* and did not recognise that *A. repens* Sonn. should have been placed as a synonym. In his redefinition he ascribed to it an obovate spike (possibly from Bontius, possibly from Rumpf), and this seems to have led Roxburgh to identify as *A. Cardamomum* Linn. a plant which he had raised from Sumatran seed: in fact he cites for it Willdenow's edition of the Species Plantarum (Asiatic Researches, xi., 1810, p. 343). Though the definition of 1810 is inadequate, we know quite well what that plant was, as a figure of it is given in Roxburgh's Plantae Coromandelianae (1819, plate 227). Roscoe was at the time working at the genera of the Zingiberaceae in Britain, and fixed his idea of *Amomum* by Bontius' figure (Trans. Linn. Soc., viii., 1807, p. 352); but with Roxburgh really commences a clear conception of what *Amomum* might be, and he added to the genus several species which all botanists have kept in *Amomum*; and Maton in the year 1811 (Trans. Linn. Soc., x. p. 249), created the genus *Elettaria* for *Amomum Cardamomum* Linn. Blume in 1827 (Enum. Fl. Jav. i. p. 48) used Linnaeus' name like Roxburgh, for the wrong species.

Under our circumstances, the common-sense procedure is to conserve *Amomum* Roxb., abandoning *Amomum* Linn., and to take as a type-species one of Roxburgh's own, preferably *A. aculeatum*, of which he gave a figure in 1810. To make this effective the genus should be conserved also against Giseke's proposed genera *Meistera*, *Wurfbainia*, *Paludana*, and *Etlingera* (Praelect. in Ord. Nat. plant, 1792, pp. 205–209) and *Elettaria* Maton against *Amomum* Linn.

It is not possible to obtain a rational foundation for *Amomum* earlier than Roxburgh's work. There are objections against considering Willdenow to be the creator of the present *Amomum*, as it is not possible to take his *A. Cardamomum* for a type species. Nor is it possible to take Roscoe's. Both were confused. There are strong objections against bringing into the argument Koenig's and Loureiro's species, for we do not know exactly what any of them are, though, commencing with Karl Schumann, botanists have been in the habit of affixing the name *A. uliginosum* Koen. to a Malacca plant, Koenig having observed his specimen in Junkseylon.

A. Cardamomum Roxb. of course must have a new name; and **A. Kepulaga** *Sprague and Burkill* is proposed, kepulaga being the Javanese name for the cardamom which it gives.

Cardamoms of International Commerce.

Elettaria Cardamomum Maton

var. **minuscula** *Burkill*, the Mysore cardamom, the Malabar cardamom and the Mangalore cardamom.

var. *major* Thwaites, the Ceylon or Greater cardamom, or Long cardamom or "Wild" native cardamon (of Ceylon).

Amomum subulatum Roxb., the Greater Indian or Nepal cardamom.
Amomum Krervanh Pierre, the Cambodian cardamom.
Amomum Kepulaga Sprague and Burkill, the Round cardamom of Java or the Cluster cardamom.
Aframomum Melegueta K. Schum., Grains of Paradise (peppery) from the west coast of Africa.
Aframomum Granum-paradisi K. Schum., ditto.
Aframomum sp., the Korarima cardamom (*Amomum Korarima* Pereira, from East Africa.

Cardamoms of Internal Trade, and local use.

India :

Amomum aromaticum Roxb. Apparently this was grown formerly in Bengal and its cardamoms were an article of trade. Though Sir George Watt failed to find it about 1890, Sir George King obtained evidence of its use.

Languas Galanga *Burkill* (*Alpinia Galanga* Swartz), yielding the Galangal cardamom.

China and Indo-China :

Amomum echinosphaera K. Schum., its camphoraceous cardamoms selling as kreko shmol in Cambodia and along with others in Annam as sa-nhan. They are reckoned next in value to those of *Amomum Krervanh*.

Amomum xanthioides Wall., the Xanthioid cardamom of Tenasserim and Siam. The Hairy China cardamom which has been unsatisfactorily traced to *Amomum villosum* Lour., Tschirch cautiously ascribes to the neighbourhood of *A. xanthioides*.

Amomum sp., a very similar Chinese cardamom, camphoraceous, and differing from the last in having few prickles on the fruit-wall.

Amomum sp., an ovoid cardamom assigned to *A. ovoideum* Pierre ; but perhaps the same as the last.

Amomum sp., grown in Yunnan, and very near to *A. aromaticum*. Like others it sells in China as tsao-kou. It was figured by Hanbury as the Ovoid China cardamom, and called *A. medium* ; but it is not *A. medium* Lour.

Amomum sp., the large round China cardamom described by Hanbury.

Amomum Tomrey Gagnep., the tom-rey of Indo-China.

Amomum sp., the bitter-seeded cardamom of China, which is stated to be obtained in Yunnan, Kwang-tung and Cochinchina. Tschirch suggests that it is derived from *Costus speciosus* ; but this is not possible. It possesses the name of *Amomum amarum* F. P. Smith, and certainly is an *Amomum*.

Unidentified cardamoms of Indo-China, traded in as krakor-sva or red krakor, krakor sar or white krakor, and krakor momis or velvety krakor.

Languas globosa *Burkill* (*Alpinia globosa* Horanin., *Amomum globosum* Lour., *A. glabrum* Baill.), the small round China cardamom, sold as tsao-kou and as sa-hnan.

Languas Galanga Burkill, as in India.
Languas conchigera *Burkill* (*Alpinia conchigera* Griff.).

Malaysia :—

Amomum dealbatum Roxb., which name, as Valeton has shewn (in Bull. Jard. Bot. Buitenzorg, ser. 3, 2, 1920, p. 355), covers the *A. maximum* of several authors. It is cultivated in Java, and is also found wild in the teak forests.

Riedelia curviflora Oliv., used in Eastern Malaysia.

Vanoverberghia sepulchrei Merr., used in the Philippines, also other species mentioned above under *Amomum* and *Languas*.

Africa :—

Aframomum, several species, including *A. angustifolium* K. Schum., *A. mala* K. Schum., *A. Hanburyi* K. Schum., **A. macrospermum** *Burkill* (*Amomum macrospermum* Smith) and *A. latifolium* K. Schum.

The word cardamom entered the languages of Europe through Greek, but certainly was not a Greek word in the beginning. It consists of amômon and a prefix, card-, the origin of which is unknown ; some have suggested that it came from a south India language and meant wild, but that is a guess only. Theophrastus in the fourth century B.C. knew two spices, cardamomon and amomon, which came to Greece through Media, but he did not describe them. Dioscorides, five centuries later, stated that cardamomon was the best of the aromata which came to the Levant by Commagene, Armenia and the Bosphorus, and therefore from the east. He calls it pungent and rather bitter. Galen, his immediate successor, and other physicians who followed, likewise attributed bitterness to it. As none of the cardamoms of international trade are really bitter, though sometimes there is a slight bitterness in *Elettaria Cardamomum* var. *major*, writers have asserted that the cardamomon of the Greeks was none of the modern cardamoms. The sanskrit gave to modern Indian vernaculars words for the cardamons akin to ela, and left in Java ela-ela for *Amomum gracile* Blume, a plant much closer in appearance to *Amomum aromaticum* than to *Elettaria Cardamomum*. Such words do not appear to have left any record among the Greeks, and it seems impossible to arrive at a clear understanding as to what was the oldest known cardamomon. Indeed Theophrastus may have meant a group of species rather than one in particular, for Pliny certainly used the word cardamomum for a group. In Pliny's time four kinds were sold in Rome : " Quatuor ejus genera : viridissimum ac pingue, acutis angulis, contumax fricanti, quod maxime laudatur : proximum e rufo candicans : tertium brevius atque nigrius. Pejus tamen varium et facile tritu, odorisque parvi : qui verus, costo vicinus esse debet." Pliny calls them oblong seeds, an expression which fits the cardamoms from *Elettaria* : and these probably were among the four.

IV.—TASMANIAN MUSEUM AND ART GALLERY, AND BOTANICAL GARDENS.

The Report of the Trustees for the year ended June 30th, 1929, has reached Kew in the form of a type-written copy and is a document of considerable interest, especially from the Botanical side.

Mr. L. Rodway, C.M.G., who has been one of the Trustees for many years, resigned his position in October 1920, but fortunately he has been persuaded to accept the position of Advisory Director of the Botanical Gardens and also Officer in Charge of the Botanical Section of the Museums. Tasmania owes so great a debt to Mr. Rodway for all the work he has done in connection with the Flora of the Island—which has been undertaken in an honorary capacity —that the retention of his services augurs well for the further stimulation of interest in Botanical exploration in Tasmania.

Another welcome addition to the Trustees is Mr. A. V. Giblin, who is now a valued correspondent of Kew. He is taking a very keen interest in the Flora, and is undertaking journeys from time to time to interesting localities, with the object of studying critically the various types of vegetation found at different altitudes in the Island and the possible occurrence of natural hybrids in certain genera.

It is also welcome news that the Government have agreed to increase the annual vote, but, as the Trustees very rightly point out, a larger sum than the £1500 now voted is needed in order that the Institution may be able to carry out the many lines of work which should be undertaken before it may be too late.

The Report on the Herbarium by the Director of the Museum and Art Gallery is of so much historic value that it is here reproduced, and it is followed by Mr. Rodway's Report to the Trustees.

Herbarium.

" In my report for the year 1919 I drew attention to the need for a botanical section of the Museum being established. I am glad to be able to report that after ten years effort in this direction, it has been found possible to establish an herbarium, and of even more importance, to secure Mr. Rodway's services for part time to take charge of this section of the Museum's work. Much of the initial work of establishment has been carried out by the Botanical Section of the Royal Society of Tasmania acting under the direction of Mr. L. Rodway, assisted by Mr. A. V. Giblin, to whose personal interest and activity a great deal of the present progress is due. Mr. Rodway has been ably assisted by Mrs. Rodway in several sections of the work, and thanks are due to the above and others for the progress made to date which is set out in the separate report.

" To quote from my report of ten years ago, I then stated :— ' At the present time Mr. L. Rodway, C.M.G., possesses a magnificent botanical collection, representing the work of a lifetime. This

collection includes many types and co-types. Mr. Rodway informs me he intends to present it where it will be of value and of use, but he is certainly not going to give it to any institution where it cannot be properly preserved. I hope that arrangements can be made for this collection to be officially accepted in the Tasmanian Museum.'

" Since the above was written Mr. Rodway has placed his collection of flowering plants on loan to the University, but he has already placed his collection of Cryptogams in the Tasmanian Museum Herbarium which, from present indications, will develop into the Tasmanian National Herbarium, and I venture to repeat the hope expressed ten years ago in regard to Mr. Rodway's main collection.

" Efforts are being made to secure additional financial support in order that Mr. Rodway's exceptional botanical knowledge may be available in full measure. Advice has just been received of a small Commonwealth grant to aid in research work, particularly as regards grasses and fungi, and other avenues will be approached during the year. Considering the honorary work done by Mr. Rodway for so many years past as honorary Government Botanist and the very marked assistance he has rendered to the Agricultural and Forestry Departments in particular there should be support forthcoming from these quarters if not from the Government generally.

" A detailed report of the work of this section is given in the report of the Director of the Herbarium attached hereto."

" Report of the Director of the Herbarium.

" The Chairman and Trustees of the Tasmanian Museum,

" 1st July, 1929.

" Gentlemen,

" The Tasmanian Museum Herbarium was established in November 1928 and fills a long felt want as regards the work of the Museum and Tasmania generally.

" The need for active botanical research on the economic side is particularly urgent in a country such as Tasmania, and especially so owing to its present state of development. The Herbarium has been equipped with shelving, specimen cases, sorting cabinets, and office fittings as far as financial circumstances would permit. Much of the work being done in the Herbarium is being carried out in an honorary capacity by members of the botanical section of the Royal Society, acting under my direction.

" The initial and present main work consists of the collection, identification, preservation and cataloguing of a complete collection of the Tasmanian flora, together with a second set intended for the Federal Herbarium at Canberra, as well as a third set for Kew. This work is being done in close collaboration with Dr. Hill, Director of Kew, who laid the foundation of this phase of the work during his recent tour to Tasmania. To date, over 700 flowering plants

have been duly mounted and an equal number of Fungi. The Hepatics and other sections are also receiving attention. The preparation of a vernacular list of Tasmanian plants is also being given consideration.

"The Trustees are appealing for additional funds in order to extend the work of the Herbarium, and in the event of such funds being secured the following, among other matters, will receive attention :—The study of fungi and their effect on vegetation, the formation of a collection of plants affected by diseases caused by fungi, the introduction to Tasmania of valuable eucalypts, and the growth under forest conditions, the improvement of pasture lands, and the investigation of Tasmania's native grasses, the utilisation of Tasmania's button grass country, cross-fertilisation and improvement of certain native plants of economic use, the investigation of native plants other than eucalypts suitable for paper production.

"Considering the short time the Herbarium has been in operation considerable progress may be claimed to have been made as regards this section of the Museum's work.

LEONARD RODWAY,
27.6.29. Director of the Herbarium."

The remarks of the Director of the Museum and Art Gallery as to Mr. Rodway's invaluable services to Tasmanian Botany need no endorsement, and it is to be hoped that a generous response may be forthcoming, either from Government or from private sources, to recompense him to some extent for all he has done to further the study of the vegetation of Tasmania.

Now that interest in the Tasmanian flora has been so much stimulated and a band of keen workers is being got together the Report giving the results for the present year will be eagerly awaited. We also look forward with keen interest to the promised sets of specimens for the Kew Herbarium.

There is also a Report of the Superintendent of the Botanic Gardens, but as this is a document mainly of local interest it is not reproduced.

The Hobart Botanic Gardens are beautifully situated on sloping ground overlooking the magnificent harbour, and the fine lawns very much enhance their charm. The Gardens, when I visited them, were well laid out and in good condition. They are under the charge of Mr. John Wardman, the Superintendent, who in his early days received some of his horticultural training under the late Mr. R. I. Lynch at Cambridge.

There are several fine specimens of Conifers and other exotic trees, but there is no particular systematic arrangement of the plants, and the Gardens might be considered rather more as a pleasantly planted park than a strictly Botanic Garden.

In the private part there was quite a good collection of native trees and shrubs. It would add greatly to the interest and educational value of the Gardens if the display of native Tasmanian trees and shrubs could be developed and allied species from South Australia and Victoria could be grown in association with the Tasmanian plants.

It would also be of great interest if a collection of "Antarctic" trees and shrubs and herbaceous plants could be made, as the climate of Hobart would probably be eminently suitable for their growth.

Such a feature in the open would be unique as far as Botanic Gardens are concerned; it is to be hoped, therefore, that the Trustees may be able to get together a representative collection of the plants which may have spread from the old Antarctic continent, representatives of which are now found growing in Southern Chile, New Zealand and Tasmania. Such genera as *Eucryphia*, *Nothofagus*, *Knightia*, *Laurelia*, *Fuchsia* and *Calceolaria*, for instance, from Chile and New Zealand, together with any of the species which are native in Tasmania, would make a collection of very great value and should stimulate interest among those who are taking up the careful study of the Tasmanian vegetation.

A. W. H.

V.—ADDITIONS TO INDEX KEWENSIS: X.*

Journal of Botany 1924, 1925, Supplements.
Dr. H. O. Forbes's Malayan Plants.

Owing to an unfortunate oversight the new names contained in the above work were omitted from the Index Kewensis, Supplement VII, and are therefore being included in Supplement VIII. In order to minimize the risk of these names being overlooked in the meantime, a list of them is given below. All new names are followed by the author's name and reference to the page in the Supplement to the Journal of Botany. In the case of new species the locality is cited, and new transfers are followed by the binary names on which they are based.

M. L. G.

[Journal of Botany 1924, Supplement.]

POLYPETALAE.

Annonaceae.

Polyalthia Kingii E. G. Baker 3.—Sumatra.
subsessilifolia E. G. Baker 3.—Sumatra.
Goniothalamus Forbesii E. G. Baker 4.—Sumatra.

Polygalaceae.

Xanthophyllum Forbesii E. G. Baker 7.—Sumatra.

Tiliaceae.

Grewia Henrici E. G. Baker 13.—Sumatra.
sumatrana E. G. Baker 13.—Sumatra.
Elaeocarpus celebesianus E. G. Baker 14.—Celebes; Java.

* Continued from *Kew Bull.* 1926, p. 483.

Burseraceae.

Santiria Forbesii E. G. Baker 16.—Sumatra.
longepaniculata E. G. Baker 17.—Sumatra.

Meliaceae.

Dysoxylum brachypodum E. G. Baker 17.—Sumatra.
lasiophyllum E. G. Baker 18.—Sumatra.
Chisocheton sumatranus E. G. Baker 18.—Sumatra.
dempoënsis E. G. Baker 18.—Sumatra.
Aglaia kabaënsis E. G. Baker 19.—Sumatra.
longepetiolulata E. G. Baker 20.—Sumatra.
pyricarpa E. G. Baker 20.—Sumatra.

Olacaceae.

Phytocrene Forbesii E. G. Baker 21.—Java.
Strombosia rapaneoides S. Moore 22.—Sumatra.

Ampelidaceae.

Leea Forbesii E. G. Baker 24.—Sumatra.

Sapindaceae.

Lepisanthes Forbesii E. G. Baker 25.—Sumatra.
Nephelium Forbesii E. G. Baker 25.—Sumatra.
Pometia Forbesii E. G. Baker 26.—Sumatra.
Guioa Forbesii E. G. Baker 26.—Sumatra.

Balsaminaceae.

Impatiens albo-rubra Hook. f. 27.—Sumatra.
dempoana Hook. f. 27.—Sumatra.
Forbesii Hook. f. 28.—Sumatra.
heterosepala Hook. f. 28.—Sumatra.
lonchocarpa Hook. f. 29.—Sumatra.

Leguminosae.

Mucuna ovalis E. G. Baker 32.—Sumatra.

Rosaceae.

Pygeum glabrifolium E. G. Baker 33.—Sumatra.
viride E. G. Baker 34.—Sumatra.

Myrtaceae.

Aphanomyrtus Forbesii Greves 36.—Sumatra.
Eugenia amboinensis Greves 36.—Amboina.
dempoënsis Greves 36.—Sumatra.
kabaënsis Greves 38.—Sumatra.
siphonantha King ex Greves 38.—Sumatra.

Melastomaceae.

Marumia ciliatiloba E. G. Baker 40.—Sumatra.
Medinilla verrucosa E. G. Baker 41.—Sumatra.
sumatrana E. G. Baker 41.—Sumatra.
Pternandra Forbesii E. G. Baker 41.—Sumatra.

Samydaceae.

Casearia Forbesii E. G. Baker 43.—Sumatra.

Begoniaceae.

Begonia longepetiolata E. G. Baker 44.—Sumatra.

Araliaceae.

Schefflera canaliculata E. G. Baker 44.—Sumatra.

Gamopetalae.

Rubiaceae.

Nauclea superba S. Moore 46.—Sumatra.
megaphylla S. Moore 47.—Sumatra.
Lerchea capitata S. Moore 48.—Sumatra.
Ophiorrhiza extenuata S. Moore 48.—Sumatra.

Tarenna scabrida S. Moore 49.—Sumatra.
mollis S. Moore 50 : Webera mollis.
Randia jasminiflora S. Moore 50.—Sumatra.

Compositae.
Vernonia Forbesii S. Moore 54.—Sumatra.

Vacciniaceae.
Vaccinium pensile S. Moore 55.—Sumatra.
fastigiatum S. Moore 56.—Sumatra.
eugenioides S. Moore 56.—Sumatra.

Myrsinaceae.
Ardisia subtilis S. Moore 58.—Sumatra.

Sapotaceae.
Bassia magnifolia King ex S. Moore 60.—Sumatra.
Forbesii King ex S. Moore 60.—Sumatra.
sericea King ex S. Moore 61.—Sumatra.
Payena ornata S. Moore 61.—Sumatra.
eugeniaefolia King ex S. Moore 61.—Sumatra.

Ebenaceae.
Diospyros sphenophylla Hiern 62.—Java.
refracta Hiern 63.—Sumatra.
globulifera Hiern 63.—Sumatra.
lonchophylla Hiern 63.—Sumatra.
Jabadii Hiern 64.—Sumatra.
Maba Forbesii Hiern 64.—Sumatra.

Oleaceae.
Jasminum curtilobum S. Moore 66.—Sumatra.

Loganiaceae.
Fagraea spatiosa S. Moore 69.—Sumatra.
pyriformis S. Moore 70.—Sumatra.

Gentianaceae.
Gentiana humifusa S. Moore 70.—Sumatra.
Limnanthemum sumatranum S. Moore 71.—Sumatra.

Cyrtandraceae.
Aeschynanthus dempoënsis S. Moore 73 : A. Forbesii, Ridley.
Agalmyla brevifolia S. Moore 73.—Sumatra.
Stauranthera parvifolia S. Moore 73.—Sumatra.
Chirita Ridleyana S. Moore 74 : C. Forbesii, Ridley.
Cyrtandra perplexa S. Moore 74.—Sumatra.
locuples S. Moore 75.—Sumatra.
flabellifolia S. Moore 75.—Sumatra.
minor S. Moore 75.—Sumatra.
scutata S. Moore 76.—Sumatra.

Acanthaceae.
Staurogyne setisepala C. B. Clarke ex S. Moore 77.—Sumatra.
Strobilanthes assimulatus S. Moore 77.—Sumatra.
thunbergiaeflorus S. Moore 78.—Sumatra.
deminutus S. Moore 78.—Sumatra.
Hypoëstes bantamensis S. Moore 79.—Java.

Verbenaceae.
Callicarpa rudis S. Moore 80.—Sumatra.
Ridleyi S. Moore 80.—Java.
Clerodendron lanceoliferum S. Moore 81.—Sumatra.

MONOCHLAMYDEAE.

Piperaceae.

Piper accedens S. Moore 84.—Java.
late-oblongum S. Moore 84.—Java.

Lauraceae.

Litsea crebriflora S. Moore 87.—Sumatra.
prolixa S. Moore 88.—Amboina.
Neolitsea formosa S. Moore 88.—Sumatra.
latifolia S. Moore 89 : Litsea latifolia.

Santalaceae.

Scleropyrum moschiferum S. Moore 90 : Pyrularia moschifera.
Calyptosepalum S. Moore 91 (gen. nov.).
sumatranum S. Moore 92.—Sumatra.

Euphorbiaceae.

Cleistanthus castus S. Moore 93.—Sumatra.
Glochidion pusilliflorum S. Moore 93.—Sumatra.
peltiferum S. Moore 94.—Sumatra.
versicolor S. Moore 94.—Sumatra.
disparilaterum S. Moore 95.—Sumatra.
prinoides S. Moore 95.—Java.
foliosum S. Moore 96.—Sumatra.
grave S. Moore 96.—Sumatra.
Drypetes microphylloides S. Moore 97.—Sumatra.
Neoscortechinia sumatrensis S. Moore 99.—Sumatra.
Clonostylis S. Moore 101 (gen. nov.).
Forbesii S. Moore 101.—Sumatra.
Blumeodendron sumatranum S. Moore 102.—Sumatra.
cuneatum S. Moore 103.—Sumatra.
Gelonium sumatranum S. Moore 104.—Sumatra.
affine S. Moore 104.—Sumatra.

Moraceae.

Ficus tenuipes S. Moore 107.—Timor.
nitentifolia S. Moore 107.—Timor.
reticulatissima S. Moore 108.—Timor.
tenimbrensis S. Moore 111.—Timor Laut.
Artocarpus brunneifolia S. Moore 112.—Sumatra.
Conocephalus Forbesii S. Moore 112.—Amboina.

Urticaceae.

Pellionia sumatrana S. Moore 113.—Sumatra.

Fagaceae.

Pasania induta S. Moore 114 : Quercus induta.
daphnoidea S. Moore 114 : Quercus daphnoidea.
rajah S. Moore 115 : Quercus rajah.

MONOCOTYLEDONES.

Orchidaceae.

Eria rhinoceros Ridley 116.—Sumatra.
Calanthe breviflos Ridley 117.—Java.
Forbesii Ridley 117.—Sumatra.
Phalaenopsis Forbesii Ridley 118.—Sumatra.
Sarcanthus Forbesii Ridley 118.—Java.
Forbesina Ridley 120 (gen. nov.).
eriaeformis Ridley 120.—Sumatra.

Zingiberaceae.

Alpinia Annabellae Ridley 121.—Amboina.

Haemodoraceae.

Ophiopogon caulescens Ridley 122 : Chloopsis caulescens.
acaulis Ridley 122 : Chloopsis acaulis.

Commelinaceae.

Forrestia distans Ridley 124.—Java.

Palmae.

Pinanga Forbesii Ridley 124.—Sumatra.

VI.—MISCELLANEOUS NOTES.

The retirement of Dr. A. B. Rendle, F.R.S., from the Keepership of Botany, British Museum (Natural History), is announced to take effect in January, 1930. Dr. Rendle joined the Museum Staff in 1888 and succeeded to the Keepership as long ago as 1906, on the retirement of the late Mr. George R. M. Murray, the algologist.

During his period of service at the Museum he has found time, in addition to his administrative duties, to pursue actively his interest in the study of the Monocotyledons. This has found expression in many publications. His Classification of the Flowering Plants, Gymnosperms and Monocotyledons (1904), was for many years the standard textbook of its kind. He was responsible for the sections dealing with the Monocotyledons in several papers in the Journal of the Linnean Society, on Wollaston's Ruwenzori plants (1908), Swynnerton's Gazaland collection (1911) and Compton's New Caledonian plants (1921). He also collaborated with the late Mr. William Fawcett in the preparation of four volumes of the Flora of Jamaica (1910–26), and contributed the account of Urticaceae published in the Flora of Tropical Africa (1917).

A long association with the Linnean Society, of which he became a Fellow in 1888, culminated in his election to be President of the Society in 1923, a fitting recognition of the service he has done the Society during his four periods on the Council, and as Botanical Secretary from 1916 to 1923. As representative of the Linnean Society he took a prominent part in the International Botanical Congress held at Vienna in 1905.

Dr. Rendle has always taken a keen interest in the question of botanical nomenclature. In conjunction with the late Mr. James Britten, he compiled a revised list of the names of British Seed-Plants and Ferns (1907), embodying various changes required to bring the nomenclature into accordance with the International Rules of Nomenclature adopted by the Vienna Congress. He also presided over the sectional meeting on Nomenclature held at the Imperial Botanical Conference, London (1924), when several important resolutions for the modification of the International Rules were adopted for recommendation to the next International Botanical Congress.

In addition to these activities Dr. Rendle has for many years been Professor of Botany to the Royal Horticultural Society, whose Victoria Medal of Honour in Horticulture he received in 1917.

His keen interest in British Botany is perhaps best shown in his contributions to the Journal of Botany, the editorship of which he took over on the death of the late Mr. James Britten. He has always taken an interest in local natural history societies and has been President of the South Eastern Union of Natural History Societies.

Dr. Rendle was President of Section K. of the British Association at the meeting at Newcastle in 1916. In 1909 he was elected a Fellow of the Royal Society and is now a member of the Council.

On his retirement he has the best wishes of his fellow botanists that he may for many years enjoy the opportunity to devote himself to the botanical work in which his interests lie unhampered by official duties.

He is succeeded by the Deputy Keeper in the Department, Mr. John Ramsbottom, O.B.E.

The Department of Agriculture, Trinidad.*—On retiring from the post of Director of Agriculture, Trinidad and Tobago, Mr. W. G. Freeman has taken the opportunity of presenting an interesting review of the development and work of the Department from its foundation in 1908.

"During 1928 the Department completed the first twenty years of its existence, having been founded on 1st November, 1908. As, in addition, this is the last annual report I shall write on the Department which I joined as Assistant Director in 1911, and of which I have been Director since 1917, it seems appropriate to review very briefly events during this period. Like some other Departments of Agriculture in the Empire, e.g., Jamaica, British Guiana, Ceylon, etc., the Department traces its origin back to its Botanic Garden founded in 1818, which for many years did all the work of introducing new plants, testing them, and advising on their care. The need of chemical assistance led to co-operation with the Government Analyst and in 1908 a definite Department was formed by amalgamating the Government Botanical and Analytical departments, and the Government Farm which dates from 1879. There were also put under the Department, River Estate, 1500 acres, acquired originally as a water pumping station, and St. Augustine Estate, some 3000 acres, bought to obtain a new site for the Farm. In addition there were a small Botanic Station and a Farm in Tobago.

From its origin the Department with the large properties of St. Augustine and River to administer has been in a different position from most Departments of Agriculture even now, and has had to face practical agricultural problems on an estate scale.

When the Department was formed in 1908 there was also created a Board of Agriculture, an executive body with its own funds raised

*Administration Report of the Director of Agriculture for the year 1928. Trinidad and Tobago. Government Printing Office, Trinidad, 1929, pp. 56.

by a special tax, which had control, under its own staff, of all work connected with diseases and pests, and also of agricultural education amongst the peasantry. This continued until 1920 when the Department was reorganised, all the work and staff put directly under it, and the Board of Agriculture changed to an advisory body.

From soon after the outbreak of the Great War the Department has experienced difficult times. During the war period it, not unnaturally, was understaffed. At the reorganisation it was re-modelled on a scale commensurate with the work to be done. The period of general trade depression followed very quickly; some posts were abolished or not filled. Another disastrous result was that the new Head Office building, the necessity for which had been very great for some years, although started in 1921 was not completed, and for seven more years the accommodation has been absolutely inadequate. There came the Imperial College of Tropical Agriculture, towards which the Colony gave large financial assistance (about 50 per cent. of the total contributed by all the Dominions and Colonies), and gave rise to a popular view that there was no need for both a College and a Department. The result was further reduction of staff, the Entomologist and even such an absolutely necessary officer as an Assistant Director being dispensed with. These circumstances, together with the inevitable increase in work as a country develops and new problems arise, have for a long time almost crippled the Department, and reduced its working capacity to a dangerously low level. It has pulled through as well as it could by the loyal co-operation of all the members of the staff whose devotion to their work, under very difficult conditions, I take this opportunity of putting on record."

Mr. Freeman then takes each branch of the Department and gives a general note on its activities from the date it was first started. The remainder of the Report is devoted to current work.

His reference to River Estate and St. Augustine Estate is amplified in a further section of the Report. River Estate, a property of 1500 acres, was acquired by the Government in 1897 for £4,629 to secure the water rights for a pumping station for Port-of-Spain. At that time it was an abandoned sugar estate, with a few cacao trees whose total crop was 182 bags (165 lb.). In 1908 this estate was placed under the Department of Agriculture and since 1920 has been a section of the Department. As an estate it has paid its way, and its profits have been utilised for its further development. Its cacao crop is now over 1300 bags, and the estate, which now includes areas under limes, coffee, beans, citrus, and timber, is valued at £35,000.

St. Augustine Estate was also an abandoned sugar estate. It was purchased for about £9,000 in 1900, as a new site for the Government Farm. It was managed by the Department from 1908, and some £11,000 was spent on its development. The estate was broken up in 1920 on the reorganisation of the Department, the Farm, St. Augustine Experiment Station, and two pastures—these latter

since presented to the Imperial College—and the Cotton Research Station, being retained by the Department. Some areas were sold, as was also the old machinery, whilst unsold lands were handed over to the Crown Lands Department. By 1920 the Department had repaid the original cost, deposited over £12,000 profits in the Treasury, and at that date still held land and property to the value of some £33,000.

Mr. Freeman is to be succeeded by Mr. E. J. Wortley, O.B.E., F.L.S., who has for some years been Director of Agriculture, Nyasaland.

Derris.—The extended use of " Tuba " root in the preparation of proprietary insecticides has resulted in larger areas being devoted to the cultivation of this plant in the Federated and Unfederated Malay States. According to the Annual Report of the Agricultural Department for 1928 the area now planted in Johore is about two thousand acres, though only seven hundred acres are devoted to the crop in the Federated Malay States. From experiments carried out at the Serdang Experiment Station, where several species of *Derris* are cultivated, it has been shown that there is a wide degree of variation in the toxic content of the roots of the different species and varieties. The roots of *Derris malaccensis* Prain, commonly known as " Erect Tuba," are regarded as being more highly toxic than those of *Derris elliptica* Benth. (" Tuba puteh "). An interesting fact is that the fine lateral rootlets have been shown to possess a higher toxic content than the large roots in all cases. The most suitable time for harvesting *D. elliptica* is considered to be about two years from planting, for at this stage toxicity is at a maximum, but is inclined to decrease after this period. A ready sale is said to exist locally in Malaya for the air-dried root, prices varying from 25 to 30 cents. (Straits) per lb.

F. N. H.

It is with much pleasure that we record the following ' Kew ' distinctions from the New Year's Honours List :—Mr. Joseph Jones, formerly Curator of the Botanic Gardens, Dominica, and Mr. W. R. Mustoe, Superintendent, Horticultural Operations, Delhi, to be Officers, and Mr. J. Aikman, Assistant, Royal Botanic Gardens, Kew, to be a Member, of the Most Excellent Order of the British Empire.

We learn that Mr. W. J. Bean, I.S.O., has been appointed Adviser and Consultant on the planting on Highways to the Ministry of Transport. He already advises on the planting schemes of the Technical Committee of the Roads Beautifying Association.

Dr. T. A. Sprague, Assistant, has been appointed by the Minister of Agriculture and Fisheries to the newly created post of Deputy Keeper of the Herbarium.

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